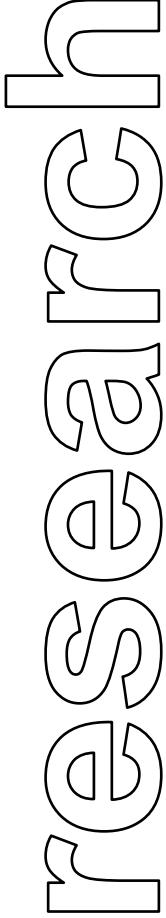


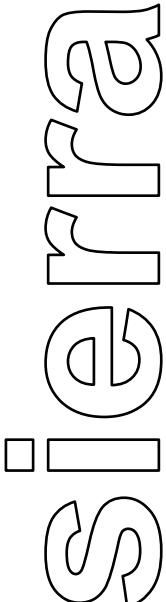
DRAFT



## **Diesel Particulate Matter Mitigation Plan for the Union Pacific Railroad Oakland Rail Yard**

prepared for:

**Union Pacific Railroad Company**



October 27, 2008

prepared by:

Sierra Research, Inc.  
1801 J Street  
Sacramento, California 95811  
(916) 444-6666



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Sierra Research, Inc.  
1801 J Street  
Sacramento, CA 95811  
(916) 444-6666

and

Robert G. Ireson, Ph.D.  
Air Quality Management Consulting  
161 Vista Grande  
Greenbrae, CA 94904

# Diesel Particulate Matter Mitigation Plan for the Union Pacific Railroad Oakland Rail Yard

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# **Diesel Particulate Matter Mitigation Plan for the Union Pacific Railroad Oakland Rail Yard**

## **I. Introduction**

In accordance with the 2005 California Air Resources Board (CARB)/Railroad Statewide Agreement (MOU), Union Pacific Railroad Company (UPRR) has prepared this Mitigation Plan for the UPRR Oakland Rail Yard. The purpose of this Plan is to outline the potential mitigation measures that can be used to reduce Diesel particulate matter (DPM) emissions from the Oakland Rail Yard. The baseline inventory for calendar year 2005 and initial estimates of health risk associated with Yard operations are detailed in the *Health Risk Assessment for the Union Pacific Railroad Oakland Railyard* (CARB, 2008).<sup>1</sup> This Plan contains sections detailing how the baseline and projected emissions were calculated, a discussion of updates to the 2005 baseline inventory since the Health Risk Assessment (HRA) Report was published by CARB, a discussion of projected growth rates and proposed mitigation measures, and a discussion of the mechanisms that will be used to track progress.

As discussed below, the proposed mitigation measures, when fully implemented, will reduce the DPM emissions from the Oakland Yard by approximately 71% from 2005 levels, even after accounting for anticipated growth in yard activities (see Section V for a discussion of the predicted growth rate). These emission reductions will concurrently lower any predicted health risk associated with the facility's operations.

## **II. Summary of Rail Yard Operations**

The Oakland Yard is an intermodal container facility. Cargo containers are received, sorted, and distributed from the facility. Activities at Oakland include receiving inbound trains, switching cars, loading and unloading intermodal trains; storage of intermodal containers and chassis; building and departing outbound trains; repairing freight cars and intermodal containers/chassis; and servicing locomotives. Facilities within the Yard include classification tracks, a gate complex for inbound and outbound intermodal truck traffic, intermodal loading and unloading tracks, a locomotive service track, a freight car repair shop, an on-site wastewater treatment plant, and various buildings and facilities supporting railroad and contractor operations. In addition, there are two warehouse distribution centers, operated by lessee Pacific Coast Containers, Inc. (PCC), located within the property boundary of the Oakland Yard. Emissions from heavy, heavy-duty Diesel truck traffic and transportation refrigeration units (TRUs) and refrigerated rail cars

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<sup>1</sup> Available at [http://www.arb.ca.gov/railyard/hra/up\\_oak\\_hra.pdf](http://www.arb.ca.gov/railyard/hra/up_oak_hra.pdf).

(reefer cars) associated with PCC operations have been included in baseline inventory and emission forecasts for future years.

Emission sources include, but are not limited to, locomotives, on-road Diesel-fueled trucks, heavy-heavy-duty Diesel-fueled trucks, cargo handling equipment (CHE), heavy equipment, and TRUs and reefer cars.

### **III. Emissions Summary**

Table 1 shows the DPM emissions from the Oakland Yard, by equipment category, for the 2005 baseline year, calendar year 2007, and for future years as the mitigation measures proposed in this Plan are implemented over time. Since the CARB HRA report was released in April 2008, additional information has become available and the 2005 baseline emission inventory has been adjusted accordingly. Table 1 shows the original 2005 emission estimates as well as the adjusted 2005 emission estimates. Each inventory update is discussed below.

As shown in Table 1, when the proposed mitigation measures are implemented, DPM emissions will be reduced by approximately 71% from 2005 levels, even after accounting for expected growth in yard activities (see Section V for a discussion on the predicted growth rate). These emission reductions will concurrently lower any existing predicted health risk related to facility operations. A detailed discussion of each mitigation measure is provided in Section VI.

**Table 1**  
**Summary of Emissions from the UPRR Oakland Rail Yard**

Equipment Category	DPM Emissions (TPY)					
	2005 <sup>a</sup>	2005-Adj <sup>b</sup>	2007	2010 <sup>f</sup>	2015 <sup>f</sup>	2020 <sup>f</sup>
Locomotives	3.9	3.7	3.4	3.4	2.9	2.4
<i>Line Haul</i> <sup>c</sup>	1.6	1.3	1.1	1.1	0.8	0.6
<i>Switch</i>	1.9	1.9	1.9	1.8	1.7	1.5
<i>Service/Maintenance</i>	0.5	0.5	0.4	0.4	0.3	0.2
Cargo Handling Equipment <sup>d</sup>	2.0	0.9	0.8	0.5	0.2	0.2
Drayage Trucks – Intermodal	1.7	1.8	1.3	1.0	0.6	0.3
HHD Trucks – Distribution Centers <sup>e</sup>	0.2	0.2	0.1	0.1	0.1	0.03
Light Duty Trucks	0.008	0.008	0.008	0.008	0.008	0.008
Diesel-Fueled Heavy Equipment	0.2	0.2	0.1	0.1	0.1	0.1
TRUs and Reefer Cars – Intermodal	1.4	1.4	1.2	0.4	0.04	0.04
TRUs and Reefer Cars – Distribution Centers <sup>e</sup>	1.8	1.8	1.5	0.5	0.04	0.05
<b>Total</b>	<b>11.2</b>	<b>9.9<sup>g</sup></b>	<b>8.4</b>	<b>5.9<sup>g</sup></b>	<b>4.0<sup>g</sup></b>	<b>3.2</b>

Notes:

- a. From the *Health Risk Assessment for the Union Pacific Railroad Oakland Railyard* (CARB, 2008).
- b. Based on new information, the emission estimates presented in the CARB HRA have been adjusted. See the Inventory Updates section below for details.
- c. Line haul emission estimates include both in-yard activity and by-passing through trains.
- d. Emissions from cargo handling equipment were adjusted to reflect the use of a more appropriate engine load factor for yard hostlers. See Section III for a complete discussion.
- e. In addition to the UPRR operations, there are two warehouse distribution centers, operated by lessee Pacific Coast Containers, Inc. (PCC), located within the property boundary of the Oakland Yard. Emissions from HHD trucks and TRUs operating at the PCC onsite facilities have been included in the inventory.
- f. Includes growth in Yard related activities (see Section V) and the proposed mitigation measures (see Section VI).
- g. The numbers shown do not add precisely due to rounding.

## **Inventory Updates**

In the adjusted 2005 inventory, the default engine load factor for yard hostlers has been revised based on new, more representative data. The default load factor (65%) for yard hostlers contained in the OFFROAD model is based on data collected for equipment operating at various facilities, and not specifically at an intermodal rail yard.<sup>2</sup> Additional data have been collected by both UPRR and Burlington Northern Santa Fe (BNSF) Railway to determine an appropriate engine load factor for yard hostlers operating at intermodal rail yards. The data collected by both railroads show that the default load factor from the OFFROAD model and the load factor from the Ports study are too high for yard hostlers operating at intermodal rail yards. Based on the UPRR and BNSF data, a more appropriate load factor for yard hostlers operating at intermodal rail yards is between 15 and 20%. Therefore, with the concurrence of CARB, the 2005 baseline emission estimates for yard hostlers that were presented in the CARB HRA report have been recalculated using a load factor of 20%.

In addition, a new version of the EMFAC model (EMFAC2007) was released after the HRA emission inventory was completed. The emission factors for heavy-heavy-duty drayage truck operations were calculated using the EMFAC model. The latest version of the model contains updated emission factors and accounts for emission reductions that will be achieved from the implementation of recently adopted Rules and Regulations. Thus, the 2005 baseline emission estimates for drayage truck operations were revised based on the EMFAC2007 model.

Additionally, in December 2007, the Regulation to Control Emissions from In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks (Drayage Truck Rule) was adopted by CARB. The Regulation, when implemented, will reduce emissions from drayage trucks transporting cargo between California's Ports and intermodal rail yards. If the Regulation is implemented as planned, CARB expects an 86% reduction of DPM emissions from drayage truck operations from 2007 levels by 2014. These reductions will be above and beyond the reductions shown in Table 1. Thus, the projected emission estimates for the 2010–2020 period are conservative, but temporally and operationally realistic.

Lastly, the locomotive emission calculations used in the HRA were found to have an error in the development of the distribution of line haul locomotive models, emission control levels (i.e., Tier), and automatic idle controls. The adjusted 2005 emissions shown here are based on the corrected model distribution.

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<sup>2</sup> A yard hostler engine load factor of 39% was calculated based on data collected at the Ports of Los Angeles and Long Beach, and was used in the HRA report for the UPRR ICTF rail yard, at CARB's direction. The 65% default factor from the OFFROAD model was used in the HRA report for the UPRR Commerce rail yard.

## IV. Emission Inventory Methodology

A general discussion of the analytical methodology and assumptions for each equipment category used to calculate emissions for the 2005 baseline and calendar year 2007 inventories, and to forecast emissions for calendar years for future years, is provided below and in Appendix A. Detailed emission calculations for the 2005 baseline year can be found in the *Toxic Air Contaminant Emission Inventory and Dispersion Modeling Report for the Oakland Rail Yard, Oakland, California* (Sierra Research, 2007).<sup>3</sup>

### 1. Locomotives

Equipment Category	DPM Emissions (TPY)					
	2005 <sup>a</sup>	2005-Adj <sup>b</sup>	2007	2010 <sup>c</sup>	2015 <sup>c</sup>	2020 <sup>c</sup>
Line Haul <sup>d</sup>	1.6	1.3	1.1	1.1	0.8	0.6
Switch	1.9	1.9	1.9	1.8	1.7	1.5
Service/Maintenance	0.5	0.5	0.4	0.4	0.3	0.2
<b>Total</b>	<b>3.9</b>	<b>3.7</b>	<b>3.4</b>	<b>3.4</b>	<b>2.9</b>	<b>2.4</b>

Notes:

- a. From the *Health Risk Assessment for the Union Pacific Railroad Oakland Railyard* (CARB, 2007).
- b. Based on new information, the emission estimates presented in the CARB HRA have been adjusted. See the Inventory Updates section above for details.
- c. Includes growth in Yard related activities (see Section V) and the proposed mitigation measures (see Section VI).
- d. Line haul emission estimates include both in-yard activity and by-passing through trains.

### **Analytical Method for Calculating Emissions**

For the 2005 baseline year, emissions from the Oakland Yard's operational locomotives were estimated for (1) "road power" (locomotives arriving and departing from the Yard with intermodal and manifest freight trains), (2) yard switching operations, and (3) emissions from locomotive service and maintenance activities.

- 2005 Road Power Emissions – UPRR databases provided basic information on all trains arriving and departing the Oakland Yard during calendar year 2005. These data included the number of trains and the number of locomotives on each train. UPRR data also provided the individual locomotive model, emission control technology (as defined by EPA Tier), and whether the locomotive was equipped with automatic start/stop idle control devices.

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<sup>3</sup> Available at [http://www.arb.ca.gov/railyard/hra/sr\\_oak\\_rpt.pdf](http://www.arb.ca.gov/railyard/hra/sr_oak_rpt.pdf).

- Emission factors for individual locomotive models and control technologies were adjusted in accordance with CARB guidance for the effects of fuel sulfur content in 2005 for both California fuel and fuel delivered in other states. These emission factors were used to calculate total emissions associated with movements into and out of the Yard based on routes followed, speeds, and throttle settings, as well as estimated idle time on arrival, and idle time prior to departure.
- 2005 Yard Switching Operations – Oakland Yard operations include the use of four low horsepower switcher locomotives, three of which work full time in the yard, and one of which spends approximately three hours of each eight-hour shift in the yard. Emissions for the 2005 baseline year were calculated based on emission factors for the specific locomotive models in use, the hours of operation, and the USEPA switcher duty cycle.
- 2005 Service and Maintenance Operations – Another UPRR database provided detailed information on the number of locomotives fueled and serviced at the service facility at the Oakland Yard. Emissions associated with servicing of road power locomotives were estimated for movements to and from the service area, as well as idle time in service. Other emissions associated with maintenance (e.g., load testing following periodic maintenance) were also calculated based on the number of such events reported in the database.

### **2007 Emission Inventory**

Locomotive emissions for line-haul, service, and maintenance operations were calculated from UPRR data for calendar year 2007 in the same manner as the emissions for the 2005 baseline year. Emission factors for 2007 were updated from those for 2005 to reflect the reductions in sulfur content for both California fuel and 47-state fuel. California refinery data show that California fuel sulfur content was reduced from 221 ppm in 2005 to 4.8 ppm in 2007. EPA's 2004 forecasts for sulfur content for 47-state fuel estimated 2639 ppm S for 2005 and 1328 ppm S for 2007.

Yard switching emissions estimates were calculated based on the assumption that hp-hrs of work by switchers is proportional to the total trailing tons of originating and terminating freight, using the 2005 estimate as the baseline. Total trailing tons of freight decreased by approximately 0.2% from 2005 to 2007. Trailing tons of freight (and therefore, total yard switching hp-hrs of work) were assumed to increase at 1 percent per year after 2007.

### **2010-2020 Emission Inventory Forecast**

UPRR locomotive acquisition and retirement projections were used to develop model- and tier-specific growth rates from 2007 to 2010. These rates were applied to the

observed fleet distribution at the Oakland Yard in 2007 to generate the locomotive fleet model and technology distribution for the 2010 inventory. The fuel sulfur content in 2010 was projected to be 15 ppm for California fuel and 307 ppm for 47-state fuel. Emission factors for 2010 were calculated for the projected fleet model distributions using the projected fuel sulfur content for California fuel and 47-state fuel in the same manner as was used for the 2007 inventory.

Emissions estimates for 2015 and 2020 were projected from the 2010 inventory based on 1% per year growth in activity after 2007. In addition, USEPA forecasts of average line haul and switcher locomotive emissions were presented in the Regulatory Impact Analysis for locomotive emission controls (EPA, 2008). After adjusting for the EPA-assumed growth rate of 1.6% per year in fuel consumption, these forecasts were used to derive control factors reflecting the effects of future mandated improvements in locomotive emission control technology. These control factors were applied to the corresponding line haul and switching emissions estimates for 2010, 2015 and 2020.

## 2. HHD Diesel-Fueled Drayage Trucks

Table 3 Summary of Emissions from Drayage Trucks at the UPRR Oakland Rail Yard						
Equipment Category	DPM Emissions (TPY)					
	2005 <sup>a</sup>	2005-Adj <sup>b</sup>	2007	2010 <sup>c</sup>	2015 <sup>c</sup>	2020 <sup>c</sup>
Traveling Emissions - Intermodal	1.1	1.3	0.9	0.7	0.4	0.2
Idling Emissions – Intermodal	0.6	0.6	0.4	0.3	0.2	0.1
Traveling Emissions – Distribution Centers	0.04	0.04	0.03	0.02	0.01	0.01
Idling Emissions – Distribution Centers	0.1	0.1	0.1	0.1	0.04	0.02
<b>Total</b>	<b>1.9<sup>d</sup></b>	<b>2.0</b>	<b>1.4</b>	<b>1.1</b>	<b>0.6<sup>d</sup></b>	<b>0.3</b>

Notes:

- a. From the *Health Risk Assessment for the Union Pacific Railroad Oakland Railyard* (CARB, 2007).
- b. Based on new information, the emission estimates presented in the CARB HRA have been adjusted. See the Inventory Updates section above for details.
- c. Includes growth in Yard related activities (see Section V) and the proposed mitigation measures (see Section VI).
- d. The numbers shown do not add precisely due to rounding.

## Analytical Method for Calculating Emissions

The 2005 baseline DPM emission estimates for drayage trucks operating at the Oakland Yard were based on the number of truck trips, the length of each trip, and the amount of time spent idling. Gate count data were used to determine the number of HHD trucks that operated at Oakland during the 2005 calendar year. UPRR personnel count the number of cargo containers processed through both the “in” and “out” gates of the Yard. Since each HHD truck holds only one cargo container, the gate counts were used to determine the number of HHD truck trips for 2005. Trucks that enter or exit the facility without a chassis and/or a cargo container are referred to as “bobtails.” Based on interviews and personal communication with the Intermodal Operations Manager at Oakland, the monthly gate counts were increased by 25% to account for bobtails.

The number of truck trips for calendar year 2007 was based on the actual gate count data for 2007 plus 25% to account for bobtails. For future years 2010-2020, the number of truck trips was based on the 2007 gate count data plus a growth factor of 1% per year.

In addition to the emissions from truck movements, an average idling time of 30 minutes per trip was assumed, to account for emissions during truck queuing, staging, loading, and/or unloading during the 2005 baseline year. Based on discussions with the Intermodal Operations Manager, the average queuing time at the gate at Oakland is less than 10 minutes per truck. In addition to idling during queuing, it was assumed that each truck idles an average of 15 minutes per trip while the chassis is connected/disconnected from the truck tractor. An additional five minutes of idling per trip was included to account for any other delays. No change in idling time per trip was assumed for calendar year 2007 or future years 2010-2020.

A fleet average emission factor for traveling exhaust emissions was calculated using CARB’s EMFAC2007 model with the BURDEN output option.<sup>4</sup> Since the fleet distribution is not known, the EMFAC2007 default distribution for Alameda County was used. Idling emission factors were calculated using the EMFAC2007 model with the EMFAC output option. Separate model runs were performed for each year.

Emissions from trucks accessing the two onsite distribution centers (operated by lessee PCC), were calculated using the same methodology. The number of truck trips was based on information provided by PCC personnel. The trip length was estimated from aerial photos of the facility. The same idling assumptions that were used for the intermodal truck operations were used for the trucks operating at the distribution centers.

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<sup>4</sup> Emission factors in grams per mile (g/mi) were calculated from the tons per day emissions (tpd) estimates and daily VMT estimates generated by the EMFAC2007 model (see Appendix A for model output). The tpd emission estimates were converted to g/mi as follows: g/mi = tpd x (2000 lb/ton) x (453.59 g/lb) x (1 day/(VMT x 1000)).

### 3. Cargo Handling Equipment (CHE)

<b>Table 4</b> <b>Summary of Emissions from Cargo Handling Equipment at the UPRR Oakland Rail Yard</b>						
Equipment Category	DPM Emissions (TPY)					
	2005 <sup>a</sup>	2005-Adj <sup>b</sup>	2007	2010 <sup>c</sup>	2015 <sup>c</sup>	2020 <sup>c</sup>
Cargo Handling Equipment <sup>d</sup>	2.0	0.9	0.8	0.5	0.2	0.2

Notes:

- a. From the *Health Risk Assessment for the Union Pacific Railroad Oakland Railyard* (CARB, 2007).
- b. Based on new information, the emission estimates presented in the CARB HRA have been adjusted. See the Inventory Updates section above for details.
- c. Includes growth in Yard-related activities (see Section V) and the proposed mitigation measures (see Section VI).
- d. Emissions from cargo handling equipment were adjusted to reflect the use of a more appropriate engine load factor for yard hostlers. See Section III for a complete discussion.

### Analytical Method for Calculating Emissions

The 2005 baseline year DPM emissions from CHE operating at the Oakland Yard were based on the number and type of equipment, equipment model year, equipment size, and the annual hours of operation. The hours of operation during the baseline year were obtained from UPRR staff. Equipment-specific emission factors were calculated using a spreadsheet developed by CARB staff and are based on the OFFROAD2007 model. As discussed above, the load factor that was used for the yard hostlers for 2005 was adjusted from the default factor of 65% from the OFFROAD model to 20% based on data collected by UPRR and BNSF.

Equipment-specific operation data were not available for calendar year 2007. Therefore, the 2007 hours of operation were assumed to be equal to the 2005 baseline year hours of operation for each equipment unit, multiplied by the ratio of the 2007 lift count to the 2005 lift count. In addition, in December 2006, CARB's *Regulation for Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards* (CHE Regulation) became effective. At the end of 2007, UPRR retired four older, higher-emitting, pieces of CHE, which were replaced with three new, lower-emitting units. The fleet makeup for the 2007 emission estimates were adjusted accordingly. In addition, the 2005 baseline equipment-specific DPM emission factors were adjusted, as needed for future year emission calculations, to show the emission reductions that will be achieved through compliance with the CHE Regulation.

For future years 2010-2020, the 2005 baseline year hours of operation were adjusted by the ratio of the predicted future year lift count<sup>5</sup> to the 2005 actual lift count. In addition, the 2005 baseline equipment-specific DPM emission factors were adjusted, as needed, to show the emission reductions that will be achieved through compliance with the CHE Regulation. It was assumed that compliance with the Regulation would be achieved through the use of verified Diesel emission control strategies (VDECS). To be conservative, it was assumed a Level 2 (50% reduction) VDECS would be used.

#### 4. Heavy Equipment

<b>Table 5</b> <b>Summary of Emissions from Heavy Equipment</b> <b>at the UPRR Oakland Rail Yard</b>						
Equipment Category	DPM Emissions (TPY)					
	2005 <sup>a</sup>	2005-Adj <sup>b</sup>	2007	2010 <sup>c</sup>	2015 <sup>c</sup>	2020 <sup>c</sup>
Diesel-Fueled Heavy Equipment	0.2	0.2	0.1	0.1	0.1	0.1

Notes:

- a. From the *Health Risk Assessment for the Union Pacific Railroad Oakland Railyard* (CARB, 2007).
- b. Based on new information, the emission estimates presented in the CARB HRA have been adjusted. See the Inventory Updates section above for details.
- c. Includes growth in Yard-related activities (see Section V) and the proposed mitigation measures (see Section VI).

#### Analytical Method for Calculating Emissions

The 2005 baseline year DPM emissions from heavy equipment operated at Oakland were based on the number and type of equipment, equipment model year, equipment size, fuel type, and the annual hours of operation. The hours of operation during the baseline year were obtained from UPRR staff. Equipment-specific emission factors were calculated using the OFFROAD2007 model.

Equipment-specific operational data were not available for calendar year 2007. Therefore, the 2005 baseline year hours of operation for each equipment unit were adjusted by the ratio of the 2007 lift count to the 2005 lift count.

All Diesel-fueled heavy equipment operated at intermodal rail yards must comply with the CHE Regulation. Therefore, the 2005 baseline equipment-specific DPM emission factors for the UPRR owned equipment were adjusted, as needed, to show the emission

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<sup>5</sup> See Section V for a discussion of the projected growth rates for the facility. Predicted lift counts are shown in Appendix B.

reductions that will be achieved through compliance with the CHE Regulation. It should be noted that much of the heavy equipment operated at the Oakland Yard is not owned by UPRR. While this equipment is required to comply with the provisions of the CHE Regulation, UPRR cannot predict the methods that will be used by the various contractors for compliance nor the compliance schedule for each contractor. Therefore, no adjustments were made to the equipment specific emission factors for the contractor owned equipment.

For future years 2010–2020, the 2005 baseline year hours of operation were adjusted by the ratio of the predicted future year lift count to the 2005 actual lift count. The 2005 baseline equipment-specific DPM emission factors for UPRR owned equipment were adjusted, as needed, to reflect the emission reductions that will be achieved through compliance with the CHE Regulation. It was assumed that compliance with the CHE Regulation will be achieved through the use of a VDECS. To be conservative, it was assumed a Level 2 (50% reduction) VDECS would be used. As noted above, the emission factors for contractor owned heavy equipment were not adjusted.

## 5. Transport Refrigeration Units (TRUs) and Refrigerated Railcars (Reefer Cars)

<b>Table 6</b> <b>Summary of Emissions from TRUs and Reefer Cars</b> <b>at the UPRR Oakland Rail Yard</b>						
Equipment Category	DPM Emissions (TPY)					
	2005 <sup>a</sup>	2005-Adj <sup>b</sup>	2007	2010 <sup>c</sup>	2015 <sup>c</sup>	2020 <sup>c</sup>
TRUs – Intermodal	1.3	1.3	1.1	0.3	0.03	0.04
Reefer Cars – Intermodal	0.1	0.1	0.1	0.03	0.002	0.002
TRUs – Distribution Centers	1.2	1.2	1.0	0.3	0.03	0.03
Reefer Cars – Distribution Centers	0.6	0.6	0.5	0.1	0.01	0.01
<b>Total</b>	<b>3.2</b>	<b>3.2</b>	<b>2.7</b>	<b>0.8</b>	<b>0.1</b>	<b>0.1</b>

Notes:

- a. From the *Health Risk Assessment for the Union Pacific Railroad Oakland Railyard* (CARB, 2007).
- b. Based on new information, the emission estimates presented in the CARB HRA have been adjusted. See the Inventory Updates section above for details.
- c. Includes growth in Yard-related activities (see Section V) and the proposed mitigation measures (see Section VI).

## **Analytical Method for Calculating Emissions**

The 2005 baseline year emissions from TRUs and reefer cars are based on the average size of the units, the average number of units in the Yard, and the hours of operation for each unit. The hours of operation were from CARB's *Staff Report: Initial Statement of*

*Reason for Proposed Rulemaking for Airborne Toxic Control Measure (ATCM) for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate* (October 2003).<sup>6</sup> It is assumed the number of units and the annual hours of operation remain constant over the course of each year, with individual units cycling in and out of the Yard. Emission factors for TRUs and reefer cars were obtained from the OFFROAD2007 model.

For the 2007 calendar year and 2010-2020 future year emission estimates, the average number of units in the Yard was calculated by multiplying the 2005 equipment count data by the ratio of the predicted future year lift count to the 2005 lift count. The 2005 baseline year DPM emission factors were adjusted, as needed, to show the emission reductions that will be achieved through compliance with the TRU ATCM. UPRR does not own or operate the TRUs that pass through the Oakland Yard. Therefore, specifics on how units will comply with the ATCM were not available. For the purposes of this Plan, it is assumed that all TRUs operating in the Yard will comply with the emission levels contained in the ATCM by the compliance deadline.

Emissions from TRUs and reefer cars operating at the PCC distribution centers were calculated using the same methodology. The number of container-type TRUs is assumed to be equal to the total number of truck bays minus the number of bays with a reefer plug. Number of reefer cars per day was provided by PCC. The same 1% growth rate as the Oakland Yard was applied for 2007 and future year emission estimates.

## 6. Other Miscellaneous Diesel-Fueled Equipment

**Table 7**  
**Summary of Emissions from Light Duty Trucks**  
**at the UPRR Oakland Rail Yard**

Equipment Category	DPM Emissions (TPY)					
	2005 <sup>a</sup>	2005-Adj <sup>b</sup>	2007	2010	2015	2020
Traveling Emissions	0.006	0.006	0.006	0.006	0.006	0.006
Idling Emissions	0.002	0.002	0.002	0.002	0.002	0.002
<b>Total</b>	<b>0.008</b>	<b>0.008</b>	<b>0.008</b>	<b>0.008</b>	<b>0.008</b>	<b>0.008</b>

Notes:

- a. From the *Health Risk Assessment for the Union Pacific Railroad Oakland Railyard* (CARB, 2007).
- b. Based on new information, the emission estimates presented in the CARB HRA have been adjusted. See the Inventory Updates section above for details.

<sup>6</sup> Available at <http://www.arb.ca.gov/regact/trude03/trude03.htm>.

## **Analytical Method for Calculating Emissions**

Light-Duty Trucks – Emissions from light-duty Diesel-fueled trucks operating at the Yard are based on the engine model year, vehicle class, annual vehicle miles traveled (VMT), and the amount of time spent idling. Vehicle-specific emission factors for travel exhaust and idling were calculated using the EMFAC2007 model.

For calendar years 2007 and 2010 through 2020, emission factors were calculated using the EMFAC2007 model. It is assumed that the fleet mix and activity data were unchanged from the 2005 baseline year.

## **V. Projected Growth Rates**

The emission estimates presented in Table 1 account for the expected growth in operations at UPRR's California facilities. While it is not possible to accurately predict future goods movements needs, a reasonable estimate of growth was determined based on historic data. Based on a review of historic fuel use data and other historic operational factors, such as lift counts, tons of freight, etc., and discussions with CARB staff, it was determined that a long-term growth rate of 1% per year is appropriate for the Oakland Yard. Detailed data, including Diesel fuel consumption, revenue ton-miles of freight, and gross ton-miles of freight, are contained in Appendix B.

## **VI. Mitigation Measures**

### **1. Current Mitigation Measures**

As shown in Table 1, by 2007, emissions of DPM have been reduced 25% from the 2005 baseline year. These reductions were achieved through the implementation of the measures listed below.

- Retrofit of idle control devices – By the end of 2007, 96% of UPRR's intrastate locomotives had been equipped with idle control devices. By June 2008, 100% of UPRR's intrastate locomotives are equipped with idle control devices.
- Use of idle control devices on new locomotives – All new locomotives purchased since 2001 are equipped with factory-installed automatic idle control devices.
- Increased fuel efficiency – Aggressive fuel consumption efforts have achieved a 12% improvement in fuel efficiency since 1995.
- Cleaner new line haul locomotives – UPRR has acquired more than 800 new, cleaner Tier 2 line haul locomotives since they were introduced in 2005.

- Cleaner existing line haul locomotives – UPRR has remanufactured more than 1,800 older line haul locomotives with new, lower emitting components since 2000.
- Cleaner fuels – Only Ultra-Low Sulfur Diesel (ULSD) fuel is being dispensed in California.
- Cleaner cargo handling equipment – Since 2005, UPRR has retired six pieces of higher-emitting CHE. Three new rubber tire gantry (RTG) cranes, equipped with the cleanest engines available, have been purchased for the Yard. In addition, a VDECS will be installed on each new RTG unit during 2008. The installation of the VDECS will further reduce the DPM emissions from these units.
- Employee training – Aggressive employee training is being implemented to reduce unnecessary idling and ensure trains are operated in the most efficient manner by the locomotive engineers, thereby reducing fuel consumption and emissions.

## 2. Proposed Future Mitigation Measures

To achieve additional DPM reductions, UPRR proposes to implement the mitigation measures outlined below.

- Continued acquisition of Tier 2 line haul locomotives and newer technology locomotives as they become available.
- Continued remanufacture and retrofit of older line haul locomotives with new, lower-emitting components and automatic idle controls.
- Continued retirement of older locomotives from the fleet.
- Continued reductions in unnecessary locomotive and equipment idling through employee training.
- Continued modernization of CHE – By 2010, much of the 1988 through 2006 model year CHE that is currently operating at the Oakland Yard (a total of 13 units) will be replaced with newer, cleaner equipment or retired from service in California. The new units will be equipped with either an engine certified to the Tier 4 standards or an engine certified to the highest available Tier combined with a VDECS.
- Cleaner drayage fleet – Natural fleet turn-over coupled with the Port’s Clean Truck Program and CARB’s proposed drayage truck regulation will continue to reduce DPM emissions from these vehicles.

- Cleaner TRUs – Beginning in 2008, TRUs will be required to meet lower emission standards contained in the ATCM. The standards are further reduced beginning in 2010.

## VII. Evaluation of Additional Mitigation Measures

In addition to the proposed mitigation measures discussed above, UPRR will evaluate the use of other mitigation measures, on a case-by-case basis. Measures that are found to be safe, legal, technologically and operationally feasible, and cost-effective will be further evaluated for implementation.

## VIII. Mechanisms for Tracking Progress

UPRR will track the progress and effectiveness of the mitigation measures using a variety of methods. Mechanisms for tracking progress could include, but are not limited to, the following:

- Recordkeeping – The CHE Regulation requires detailed recordkeeping and reporting for all CHE fleets. These records can be used to determine when higher-emitting equipment is replaced by newer, cleaner technology and/or when a VDECS has been installed.

In addition, UPRR maintains detailed records of Diesel fuel usage. A reduction in the amount of fuel used corresponds to a reduction in emissions.
- Compliance with Regulations – By maintaining compliance with current and proposed regulations, such as the CHE Regulation, UPRR will be able to demonstrate a reduction in DPM emissions at the Oakland Yard.
- Compliance with Other Agreements – By demonstrating compliance with the 1998 MOU, which requires locomotives operating in the South Coast Air Basin (SoCAB) to meet a Tier 2 equivalent fleet average, emission reductions at the Oakland Yard can be shown because many of the same locomotives utilize the Oakland Yard as well as yards in the SoCAB.
- Inventory Updates – Periodic updates to the emission inventory can be used to demonstrate actual emission reductions achieved at the Oakland Yard. Due to the time and data required to prepare a complete rail yard inventory, UPRR is proposing to prepare inventory updates no more frequently than once every two years.

## **IX. Conclusions**

As shown in Table 1, the proposed mitigation measures, when fully implemented, will reduce the DPM emissions from the Oakland Yard by approximately 71% from 2005 levels. These emission reductions will concurrently lower any existing predicted health risk associated with the facility operations. Other federal, state, and related air pollution control measures and plans will supplement the current and future emission reduction discussed in this Plan.

## **X. References**

CARB, 2008. *Health Risk Assessment for the Union Pacific Railroad Oakland Rail Yard*. ([http://www.arb.ca.gov/railyard/hra/up\\_oak\\_hra.pdf](http://www.arb.ca.gov/railyard/hra/up_oak_hra.pdf)).

EPA, 2008. *Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder*, EPA420-R-08-001a, USEPA-OTAQ, May 2008.

Sierra Research, 2007. *Toxic Air Contaminant Emission Inventory and Dispersion Modeling Report for the Oakland Rail Yard, Oakland, California*. (Available at [http://www.arb.ca.gov/railyard/hra/sr\\_com\\_rpt.pdf](http://www.arb.ca.gov/railyard/hra/sr_com_rpt.pdf)).

**APPENDIX A**  
**DETAILED EMISSION CALCULATIONS**

## **LOCOMOTIVE DATA**

**Oakland Locomotive Emissions (DPM TPY)**

	2005*	2007*	2010**	2015**	2020**
<b>Line Haul</b>	1.3	1.1	1.1	0.8	0.6
<b>Switch</b>	1.9	1.9	1.8	1.7	1.5
<b>Service/Maintenance</b>	0.5	0.4	0.4	0.3	0.2
<b>Total</b>	<b>3.7</b>	<b>3.4</b>	<b>3.4</b>	<b>2.9</b>	<b>2.4</b>

\* Actual

\*\* Forecast assuming 1% p.a. growth after 2007, UPRR-projected fleet turnover through 2010, and control factors for new EPA emission standards for 2010-2020

## Emission Calculations

### Initial calculations:

2005 and 2007 from actual data

2010 based on 2007 activity and projected change in fleet composition from 2007 without EPA (200

	2010 fleet @		
	2005	2007	07 activity
Thru	0.48	0.45	0.44
IM	0.36	0.30	0.31
Other	0.46	0.35	0.36
PowerMoves	0.011	0.011	0.011
Yardops	1.87	1.86	1.86
Service	0.48	0.44	0.46
Load Tests	0.004	0.002	0.002
Total	3.68	3.41	3.44

### Growth factor calculations based on trailing tons

2007 observed growth v. 2005 0.998

Annual growth after 2007 1.01

#### Growth factors:

2015 relative to 2010 1.05

2020 relative to 2010 1.10

### Projected emissions with growth, but without EPA (2004) controls

	2005	2007	2010
Thru	0.48	0.45	0.46
IM	0.36	0.30	0.30
Other	0.46	0.35	0.36
PowerMoves	0.011	0.011	0.012
Yardops	1.87	1.86	1.92
Service	0.48	0.44	0.46
Load Tests	0.004	0.002	0.002
Total	3.68	3.41	3.52

### Control factor calculations from EPA 2008 Final RIA (Tables 3-72 and 3-82)

	2010 Base	2010 Contro	2015 Control	2020 Control
EPA Line Haul Emissions	22300	21580	16928	12550
EPA Switcher Emissions	2051	1959	1883	1744

(assumes 1.6%/year growth in fuel use)

### Control factors (2015 and 2020 calculated relative to 2010 fleet)

	2010	2015	2020
Line Haul Control Factors	0.968	0.725	0.496
Switcher Control Factors	0.955	0.888	0.760

**RESULTS:****Projected and interpolated emissions with growth and control**

	<b>2005</b>	<b>2007</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Thru</b>	0.48	0.45	0.44	0.34	0.24
<b>IM</b>	0.36	0.30	0.29	0.22	0.16
<b>Other</b>	0.46	0.35	0.35	0.27	0.19
<b>PowerMoves</b>	0.011	0.011	0.011	0.01	0.01
<b>Yardops</b>	1.87	1.86	1.83	1.71	1.54
<b>Service</b>	0.48	0.44	0.44	0.34	0.24
<b>Load Tests</b>	0.004	0.002	0.002	0.00	0.00
<b>Total</b>	3.68	3.41	3.38	2.89	2.38

**LOCOMOTIVE DATA  
2005 SAMPLE CALCULATIONS**

### Activity Types

Description	Activity Code	Number of Events/Year	Locomotives per Consist	Emission Factor Group	Locomotives per Consist Working	Fraction of Calif. Fuel
Thru EB Arriving	1	6114	1.353	1	1.353	0.50
Thru EB Departing	2	6114	1.353	1	1.353	0.50
Thru WB Arriving	3	7051	1.413	1	1.413	0.50
Thru WB Departing	4	7051	1.413	1	1.413	0.50
Intermodal Train EB Arrivals	5	149	2.128	2	2.128	0.00
Intermodal Train WB Arrivals	6	1300	2.279	2	2.279	0.00
Intermodal Train EB Departures	7	924	2.135	2	2.135	0.90
Intermodal Train WB Departures	8	396	1.790	2	1.790	0.90
Intermodal EB Arriving and Departing Arrivals	9	126	2.413	2	2.413	0.00
Intermodal EB Arriving and Departing Departures	10	126	2.167	2	2.167	0.00
Intermodal WB Arriving and Departing Arrivals	11	21	2.286	2	2.286	0.00
Intermodal WB Arriving and Departing Departures	12	21	1.571	2	1.571	0.00
Other Train EB Arrivals	13	319	2.806	3	2.806	0.00
Other Train WB Arrivals	14	461	2.364	3	2.364	0.00
Other Train EB Departures	15	904	2.837	3	2.837	0.90
Other Train WB Departures	16	22	2.091	3	2.091	0.90
Other EB Arriving and Departing Arrivals	17	141	3.149	3	3.149	0.00
Other EB Arriving and Departing Departures	18	141	2.986	3	2.986	0.00
Other WB Arriving and Departing Arrivals	19	121	2.612	3	2.612	0.00
Other WB Arriving and Departing Departures	20	121	2.711	3	2.711	0.00
Power Moves Thru EB Arriving	21	148	1.926	1	1.500	0.50
Power Moves Thru EB Departing	22	148	1.912	1	1.500	0.50
Power Moves Thru WB Arriving	23	98	2.663	1	1.500	0.50
Power Moves Thru WB Departing	24	98	2.704	1	1.500	0.50
Power Moves EB Arrivals	25	13	2.846	3	1.500	0.00
Power Moves EB Departures	26	13	3.462	3	1.500	0.00
Power Moves WB Arrivals	27	26	2.615	3	1.500	0.90
Power Moves WB Departures	28	24	2.375	3	1.500	0.90
Yard Switchers -- Desert Yard	29	365	1.688	4	1.688	1.00
Yard Switchers -- Main Yard	30	365	1.688	4	1.688	1.00

Emission Factors Weighted by Model/Tier/ZTR Fractions - DPM g/hr per Locomotive												
Consist Groups	Group ID	Idle-										
		NonZTR	Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8
<b>California Fuel (221 ppm S)</b>												
Thru Trains and Power Moves	1	39.30	42.09	74.83	40.87	124.60	214.33	244.43	313.03	492.78	573.70	720.33
Intermodal Trains	2	16.52	26.61	46.46	47.00	90.88	219.52	286.79	364.08	573.70	660.36	744.84
Other Trains and Power Moves	3	32.89	38.01	68.87	42.57	116.51	217.06	255.89	330.79	517.92	601.08	731.66
Yard Switchers	4	31.00	31.00	56.00	23.00	76.00	129.19	140.61	173.27	272.65	315.58	409.05
<b>47-State Fuel (2639 ppm S)</b>												
Thru Trains and Power Moves	1	39.30	42.09	74.83	40.87	124.60	230.33	271.84	354.22	550.75	634.08	798.47
Intermodal Trains	2	16.52	26.61	46.46	47.00	90.88	238.82	318.68	410.50	642.58	739.23	839.76
Other Trains and Power Moves	3	32.89	38.01	68.87	42.57	116.51	234.02	284.52	373.79	579.32	667.15	814.64
Yard Switchers	4	31.00	31.00	56.00	23.00	76.00	136.86	156.61	197.40	303.41	341.18	442.94

Note: Idle-NonZTR is the average per-locomotive idle emission rate for the fraction of locomotives not equipped with ZTR/Auto start-stop technology

#### Locomotive Model Distributions

##### Thru Trains and Power Moves

Technology	ZTR/AESS	Switcher	GP-3x	GP-4x	SD-50	GP-60	SD-7x	SD-90	Dash 7	Dash 8	Dash 9	C-60
Pre Tier 0	No	0.0001	0.0119	0.6890	0.0018	0.0116	0.0016	0.0027	0.0033	0.0346	0.0452	0.0001
Pre Tier 0	Yes	0.0012	0.0038	0.0003	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0019	0.0000
Tier 0	No	0.0000	0.0001	0.0015	0.0001	0.0027	0.0511	0.0011	0.0000	0.0038	0.0177	0.0009
Tier 0	Yes	0.0004	0.0004	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000	0.0099	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0096	0.0000	0.0000	0.0000	0.0006	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0414	0.0000	0.0000	0.0000	0.0351	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0050	0.0000	0.0000	0.0000	0.0087	0.0000

##### Intermodal Trains

Technology	ZTR/AESS	Switcher	GP-3x	GP-4x	SD-50	GP-60	SD-7x	SD-90	Dash 7	Dash 8	Dash 9	C-60
Pre Tier 0	No	0.0000	0.0002	0.0404	0.0091	0.0231	0.0052	0.0015	0.0011	0.0764	0.0790	0.0002
Pre Tier 0	Yes	0.0008	0.0002	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0073	0.0000
Tier 0	No	0.0000	0.0000	0.0011	0.0002	0.0033	0.2857	0.0008	0.0000	0.0129	0.0289	0.0046
Tier 0	Yes	0.0000	0.0000	0.0000	0.0000	0.0003	0.0023	0.0000	0.0000	0.0000	0.0021	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0476	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.2386	0.0000	0.0000	0.0000	0.0091	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0349	0.0000	0.0000	0.0000	0.0831	0.0000

**Other Trains and Power Moves**

<b>Technology</b>	<b>ZTR/AESS</b>	<b>Switcher</b>	<b>GP-3x</b>	<b>GP-4x</b>	<b>SD-50</b>	<b>GP-60</b>	<b>SD-7x</b>	<b>SD-90</b>	<b>Dash 7</b>	<b>Dash 8</b>	<b>Dash 9</b>	<b>C-60</b>
Pre Tier 0	No	0.0000	0.0080	0.4870	0.0045	0.0380	0.0010	0.0019	0.0011	0.0436	0.0318	0.0002
Pre Tier 0	Yes	0.0043	0.0075	0.0029	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0021	0.0000
Tier 0	No	0.0000	0.0003	0.0150	0.0005	0.0093	0.1096	0.0005	0.0000	0.0080	0.0265	0.0011
Tier 0	Yes	0.0002	0.0013	0.0000	0.0000	0.0014	0.0008	0.0000	0.0000	0.0000	0.0197	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0184	0.0000	0.0000	0.0000	0.0013	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0821	0.0000	0.0000	0.0000	0.0479	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0075	0.0000	0.0000	0.0000	0.0149	0.0000

**Yard Switchers**

<b>Technology</b>	<b>ZTR/AESS</b>	<b>Switcher</b>	<b>GP-3x</b>	<b>GP-4x</b>	<b>SD-50</b>	<b>GP-60</b>	<b>SD-7x</b>	<b>SD-90</b>	<b>Dash 7</b>	<b>Dash 8</b>	<b>Dash 9</b>	<b>C-60</b>
Pre Tier 0	No	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pre Tier 0	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 0	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 0	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

<b>Track Segment</b>	<b>Segment Number</b>	<b>Length (mi)</b>
Main Line 1	1	0.149
Main Line 2	2	0.192
Main Line 3	3	0.480
From Main Line to North End of Main Yard	4	0.221
Main Line 5	5	0.146
Main Line 6	6	0.115
Main Line 7	7	0.115
Main Line 8	8	0.147
Main Line 9	9	0.172
Main Line 10	10	0.225
Main Line 11	11	0.547
Main Line 12	12	0.194
North End to Desert Yard North End	13	0.018
North End of Desert Yard #1	14	0.236
North End of Desert Yard #2	15	0.007
North Center of Desert Yard	16	0.457
Center of Desert Yard	17	0.111
South Center of Desert Yard	18	0.161
South End of Desert Yard	19	0.243
Desert Yard to IM Yard North End Split	20	0.193
IM Yard North End Split to West IM Yard	21	0.170
North End of West IM Yard	22	0.116
Center of West IM Yard	23	0.346
South End of West IM Yard	24	0.116
IM Yard South End Split to West IM Yard #2	25	0.070
IM Yard South End Split to West IM Yard #1	26	0.245
IM Yard South End Split to South End Split	27	0.517
South End Split to South End	28	0.194
IM Yard North End Split to Center IM Yard	29	0.141
North End of Center IM Yard	30	0.133
Center of Center IM Yard	31	0.399
South End of Center IM Yard	32	0.133
IM Yard South End Split to Center IM Yard	33	0.226
IM Yard North End Split to East IM Yard	34	0.132
North End of East IM Yard	35	0.132
Center of East IM Yard #1	36	0.105
Center of East IM Yard #2	37	0.292
South End of East IM Yard	38	0.132
IM Yard South End Split to East IM Yard	39	0.181
IM Yard North End Split to Service	40	0.131
Service and Ready Tracks	41	0.115
IM Yard North End Split to Manifest Yard North End #1	42	0.125
IM Yard North End Split to Manifest Yard North End #2	43	0.333
Manifest Yard North End Split to Manifest Yard	44	0.089
Manifest Yard North End	45	0.119
Manifest Yard Center	46	0.357
Manifest Yard South End	47	0.119
Manifest Yard South End to Manifest Yard South End Splt	48	0.104
Manifest Yard South End Split to South End Split	49	0.044

<b>Track Segment</b>	<b>Segment Number</b>	<b>Length (mi)</b>
South End Split to "Wye"	50	0.116
"Wye" Inlet	51	0.134
"Wye" Leg # 1	52	0.118
"Wye" Leg # 2	53	0.050
"Wye" Leg # 3	54	0.051
"Wye" Leg # 4	55	0.050
"Wye" Leg # 5	56	0.078
"Wye" Leg # 6	57	0.036
Main Line Split to Yard North End Split	58	0.382
Yard Switching - Desert Yard	59	1.204
Yard Switching - Main Yard	60	1.172

\* Note: Approximately 5% of consists for south bound trains use the "Y" to turn to be facing south

Movement Type	Activity Code	Segment Number	Speed (mph)	Duty Cycle Number	Non-ZTR Idle Time (hrs)	ZTR Idle Time (hrs)	Fraction of Segment Moving
Thru EB	1 or 2	1	25	1	0.000	0.000	1.000
"	1 or 2	2	25	1	0.000	0.000	1.000
"	1 or 2	3	25	1	0.000	0.000	1.000
"	1 or 2	4	25	1	0.000	0.000	1.000
"	1 or 2	5	25	1	0.000	0.000	1.000
"	1 or 2	6	25	1	0.000	0.000	1.000
"	1 or 2	7	25	1	0.000	0.000	1.000
"	1 or 2	8	25	1	0.000	0.000	1.000
"	1 or 2	9	25	1	0.000	0.000	1.000
"	1 or 2	10	25	1	0.000	0.000	1.000
"	1 or 2	11	25	1	0.000	0.000	1.000
"	1 or 2	12	25	1	0.000	0.000	1.000
Thru WB	3 or 4	1	25	1	0.000	0.000	1.000
"	3 or 4	2	25	1	0.000	0.000	1.000
"	3 or 4	3	25	1	0.000	0.000	1.000
"	3 or 4	4	25	1	0.000	0.000	1.000
"	3 or 4	5	25	1	0.000	0.000	1.000
"	3 or 4	6	25	1	0.000	0.000	1.000
"	3 or 4	7	25	1	0.000	0.000	1.000
"	3 or 4	8	25	1	0.000	0.000	1.000
"	3 or 4	9	25	1	0.000	0.000	1.000
"	3 or 4	10	25	1	0.000	0.000	1.000
"	3 or 4	11	25	1	0.000	0.000	1.000
"	3 or 4	12	25	1	0.000	0.000	1.000
Intermodal Train EB Arrivals	5	28	10	2	0.000	0.000	1.000
"	5	27	10	2	0.000	0.000	1.000
"	5	26	10	2	0.000	0.000	0.333
"	5	25	10	2	0.000	0.000	0.333
"	5	24	10	2	0.000	0.000	0.333
"	5	23	10	2	0.000	0.000	0.333
"	5	22	10	2	0.500	0.167	0.000
"	5	-22	10	2	0.000	0.000	0.333
"	5	-21	10	2	0.000	0.000	0.333
"	5	33	10	2	0.000	0.000	0.333
"	5	32	10	2	0.000	0.000	0.333
"	5	31	10	2	0.000	0.000	0.333
"	5	30	10	2	0.500	0.167	0.000
"	5	-30	10	2	0.000	0.000	0.333
"	5	-29	10	2	0.000	0.000	0.333
"	5	39	10	2	0.000	0.000	0.333
"	5	38	10	2	0.000	0.000	0.333
"	5	37	10	2	0.000	0.000	0.333
"	5	36	10	2	0.000	0.000	0.333
"	5	35	10	2	0.500	0.167	0.000
"	5	-35	10	2	0.000	0.000	0.333
"	5	-34	10	2	0.000	0.000	0.333
"	5	-40	10	2	0.000	0.000	1.000
Intermodal Train WB Arrivals	6	1	10	2	0.000	0.000	1.000
"	6	2	10	2	0.000	0.000	1.000
"	6	3	10	2	0.000	0.000	1.000
"	6	4	10	2	0.000	0.000	1.000
"	6	58	10	2	0.000	0.000	1.000
"	6	21	10	2	0.000	0.000	0.333
"	6	22	10	2	0.000	0.000	0.333
"	6	23	10	2	0.000	0.000	0.333
"	6	24	10	2	0.500	0.167	0.000
"	6	-24	10	2	0.000	0.000	0.333
"	6	-25	10	2	0.000	0.000	0.333
"	6	-26	10	2	0.000	0.000	0.333
"	6	-26	10	2	0.000	0.000	1.000
"	6	-25	10	2	0.000	0.000	1.000
"	6	-24	10	2	0.000	0.000	1.000
"	6	-23	10	2	0.000	0.000	1.000
"	6	-22	10	2	0.000	0.000	1.000
"	6	-21	10	2	0.000	0.000	1.000
"	6	-40	10	2	0.000	0.000	1.000
"	6	29	10	2	0.000	0.000	0.333
"	6	30	10	2	0.000	0.000	0.333
"	6	31	10	2	0.000	0.000	0.333
"	6	32	10	2	0.500	0.167	0.000
"	6	-32	10	2	0.000	0.000	0.333
"	6	-33	10	2	0.000	0.000	0.333
"	6	34	10	2	0.000	0.000	0.333
"	6	35	10	2	0.000	0.000	0.333
"	6	36	10	2	0.000	0.000	0.333
"	6	37	10	2	0.000	0.000	0.333
"	6	38	10	2	0.500	0.167	0.000
"	6	-38	10	2	0.000	0.000	0.333
"	6	-39	10	2	0.000	0.000	0.333
Intermodal Train EB Departures	7	22	10	2	0.250	0.083	0.167
"	7	21	10	2	0.000	0.000	0.167
"	7	58	10	2	0.000	0.000	0.500

Movement Type	Activity Code	Segment Number	Speed (mph)	Duty Cycle Number	Non-ZTR Idle Time (hrs)	ZTR Idle Time (hrs)	Fraction of Segment Moving
"	7	4	10	2	0.000	0.000	0.500
"	7	3	10	2	0.000	0.000	0.500
"	7	2	10	2	0.000	0.000	0.500
"	7	1	10	2	0.000	0.000	0.500
"	7	30	10	2	0.250	0.083	0.167
"	7	29	10	2	0.000	0.000	0.167
"	7	35	10	2	0.250	0.083	0.167
"	7	34	10	2	0.000	0.000	0.167
"	7	14	10	2	0.750	0.250	0.500
"	7	13	10	2	0.000	0.000	0.500
Intermodal Train WB Departures	8	24	10	2	0.250	0.083	0.167
"	8	25	10	2	0.000	0.000	0.167
"	8	26	10	2	0.000	0.000	0.167
"	8	27	10	2	0.000	0.000	0.500
"	8	28	10	2	0.000	0.000	1.000
"	8	32	10	2	0.250	0.083	0.167
"	8	33	10	2	0.000	0.000	0.167
"	8	38	10	2	0.250	0.083	0.167
"	8	39	10	2	0.000	0.000	0.167
"	8	19	10	2	0.750	0.250	0.500
"	8	20	10	2	0.000	0.000	0.500
"	8	42	10	2	0.000	0.000	0.500
"	8	43	10	2	0.000	0.000	0.500
"	8	44	10	2	0.000	0.000	0.500
"	8	45	10	2	0.000	0.000	0.500
"	8	46	10	2	0.000	0.000	0.500
"	8	47	10	2	0.000	0.000	0.500
"	8	48	10	2	0.000	0.000	0.500
"	8	49	10	2	0.000	0.000	0.500
Intermodal EB Arriving and Departing Arrivals	9	28	10	2	0.000	0.000	1.000
"	9	27	10	2	0.000	0.000	1.000
"	9	26	10	2	0.000	0.000	0.333
"	9	25	10	2	0.000	0.000	0.333
"	9	24	10	2	0.000	0.000	0.333
"	9	23	10	2	0.000	0.000	0.333
"	9	22	10	2	0.167	0.167	0.000
"	9	33	10	2	0.000	0.000	0.333
"	9	32	10	2	0.000	0.000	0.333
"	9	31	10	2	0.000	0.000	0.333
"	9	30	10	2	0.167	0.167	0.000
"	9	39	10	2	0.000	0.000	0.333
"	9	38	10	2	0.000	0.000	0.333
"	9	37	10	2	0.000	0.000	0.333
"	9	36	10	2	0.000	0.000	0.333
"	9	35	10	2	0.167	0.167	0.000
Intermodal EB Arriving and Departing Departures	10	22	10	2	0.000	0.000	0.333
"	10	21	10	2	0.000	0.000	0.333
"	10	58	10	2	0.000	0.000	1.000
"	10	4	10	2	0.000	0.000	1.000
"	10	3	10	2	0.000	0.000	1.000
"	10	2	10	2	0.000	0.000	1.000
"	10	1	10	2	0.000	0.000	1.000
"	10	30	10	2	0.000	0.000	0.333
"	10	29	10	2	0.000	0.000	0.333
"	10	35	10	2	0.000	0.000	0.333
"	10	34	10	2	0.000	0.000	0.333
Intermodal WB Arriving and Departing Arrivals	11	1	10	2	0.000	0.000	1.000
"	11	2	10	2	0.000	0.000	1.000
"	11	3	10	2	0.000	0.000	1.000
"	11	4	10	2	0.000	0.000	1.000
"	11	58	10	2	0.000	0.000	1.000
"	11	21	10	2	0.000	0.000	0.333
"	11	22	10	2	0.000	0.000	0.333
"	11	23	10	2	0.000	0.000	0.333
"	11	24	10	2	0.167	0.167	0.000
"	11	29	10	2	0.000	0.000	0.333
"	11	30	10	2	0.000	0.000	0.333
"	11	31	10	2	0.000	0.000	0.333
"	11	32	10	2	0.167	0.167	0.000
"	11	34	10	2	0.000	0.000	0.333
"	11	35	10	2	0.000	0.000	0.333
"	11	36	10	2	0.000	0.000	0.333
"	11	37	10	2	0.000	0.000	0.333
"	11	38	10	2	0.167	0.167	0.000
Intermodal WB Arriving and Departing Departures	12	24	10	2	0.000	0.000	0.333
"	12	25	10	2	0.000	0.000	0.333
"	12	26	10	2	0.000	0.000	0.333
"	12	27	10	2	0.000	0.000	1.000
"	12	28	10	2	0.000	0.000	1.000
"	12	32	10	2	0.000	0.000	0.333
"	12	33	10	2	0.000	0.000	0.333
"	12	38	10	2	0.000	0.000	0.333
"	12	39	10	2	0.000	0.000	0.333

Movement Type	Activity Code	Segment Number	Speed (mph)	Duty Cycle Number	Non-ZTR Idle Time (hrs)	ZTR Idle Time (hrs)	Fraction of Segment Moving
Other Train EB Arrivals	13	28	10	2	0.000	0.000	1.000
"	13	49	10	2	0.000	0.000	1.000
"	13	48	10	2	0.000	0.000	1.000
"	13	47	10	2	0.000	0.000	1.000
"	13	46	10	2	0.000	0.000	1.000
"	13	45	10	2	0.750	0.250	0.000
"	13	-45	10	2	0.000	0.000	0.500
"	13	-44	10	2	0.000	0.000	0.500
"	13	-43	10	2	0.000	0.000	0.500
"	13	-42	10	2	0.000	0.000	0.500
"	13	-40	10	2	0.000	0.000	0.500
"	13	45	10	2	0.000	0.000	0.500
"	13	44	10	2	0.000	0.000	0.500
"	13	43	10	2	0.000	0.000	0.500
"	13	42	10	2	0.000	0.000	0.500
"	13	20	10	2	0.000	0.000	0.500
"	13	19	10	2	0.000	0.000	0.500
"	13	18	10	2	0.000	0.000	0.500
"	13	17	10	2	0.000	0.000	0.500
"	13	16	10	2	0.000	0.000	0.500
"	13	15	10	2	0.000	0.000	0.500
"	13	14	10	2	0.750	0.250	0.000
"	13	-14	10	2	0.000	0.000	0.500
"	13	-14	10	2	0.000	0.000	0.500
"	13	-15	10	2	0.000	0.000	0.500
"	13	-16	10	2	0.000	0.000	0.500
"	13	-17	10	2	0.000	0.000	0.500
"	13	-18	10	2	0.000	0.000	0.500
"	13	-19	10	2	0.000	0.000	0.500
"	13	-20	10	2	0.000	0.000	0.500
"	13	-40	10	2	0.000	0.000	0.500
Other Train WB Arrivals	14	13	10	2	0.000	0.000	0.500
"	14	14	10	2	0.000	0.000	0.500
"	14	15	10	2	0.000	0.000	0.500
"	14	16	10	2	0.000	0.000	0.500
"	14	17	10	2	0.000	0.000	0.500
"	14	18	10	2	0.000	0.000	0.500
"	14	19	10	2	0.750	0.250	0.000
"	14	-19	10	2	0.000	0.000	0.500
"	14	-20	10	2	0.000	0.000	0.500
"	14	-40	10	2	0.000	0.000	1.000
"	14	1	10	2	0.000	0.000	0.500
"	14	2	10	2	0.000	0.000	0.500
"	14	3	10	2	0.000	0.000	0.500
"	14	4	10	2	0.000	0.000	0.500
"	14	58	10	2	0.000	0.000	0.500
"	14	42	10	2	0.000	0.000	0.500
"	14	43	10	2	0.000	0.000	0.500
"	14	44	10	2	0.000	0.000	0.500
"	14	45	10	2	0.000	0.000	0.500
"	14	46	10	2	0.000	0.000	0.500
"	14	47	10	2	0.750	0.250	0.000
"	14	-47	10	2	0.000	0.000	0.500
"	14	-48	10	2	0.000	0.000	0.500
"	14	-48	10	2	0.000	0.000	0.500
"	14	-47	10	2	0.000	0.000	0.500
"	14	-46	10	2	0.000	0.000	0.500
"	14	-45	10	2	0.000	0.000	0.500
"	14	-44	10	2	0.000	0.000	0.500
"	14	-43	10	2	0.000	0.000	0.500
"	14	-42	10	2	0.000	0.000	0.500
Other Train EB Departures	15	14	10	2	0.750	0.250	0.500
"	15	13	10	2	0.000	0.000	0.500
"	15	45	10	2	0.750	0.250	0.500
"	15	44	10	2	0.000	0.000	0.500
"	15	43	10	2	0.000	0.000	0.500
"	15	42	10	2	0.000	0.000	0.500
"	15	58	10	2	0.000	0.000	0.500
"	15	4	10	2	0.000	0.000	0.500
"	15	3	10	2	0.000	0.000	0.500
"	15	2	10	2	0.000	0.000	0.500
"	15	1	10	2	0.000	0.000	0.500
Other Train WB Departures	16	19	10	2	0.750	0.250	0.500
"	16	20	10	2	0.000	0.000	0.500
"	16	42	10	2	0.000	0.000	0.500
"	16	43	10	2	0.000	0.000	0.500
"	16	44	10	2	0.000	0.000	0.500
"	16	45	10	2	0.000	0.000	0.500
"	16	46	10	2	0.000	0.000	0.500
"	16	47	10	2	0.000	0.000	0.500
"	16	48	10	2	0.000	0.000	0.500
"	16	49	10	2	0.000	0.000	0.500
"	16	28	10	2	0.000	0.000	1.000

Movement Type	Activity Code	Segment Number	Speed (mph)	Duty Cycle Number	Non-ZTR Idle Time (hrs)	ZTR Idle Time (hrs)	Fraction of Segment Moving
"	16	47	10	2	0.750	0.250	0.500
"	16	48	10	2	0.000	0.000	0.500
"	16	49	10	2	0.000	0.000	0.500
Other EB Arriving and Departing Arrivals	17	28	10	2	0.000	0.000	1.000
"	17	49	10	2	0.000	0.000	1.000
"	17	48	10	2	0.000	0.000	1.000
"	17	47	10	2	0.000	0.000	1.000
"	17	46	10	2	0.000	0.000	1.000
"	17	45	10	2	0.500	0.500	0.000
Other EB Arriving and Departing Departures	18	45	10	2	0.000	0.000	1.000
"	18	44	10	2	0.000	0.000	1.000
"	18	43	10	2	0.000	0.000	1.000
"	18	42	10	2	0.000	0.000	1.000
"	18	58	10	2	0.000	0.000	1.000
"	18	4	10	2	0.000	0.000	1.000
"	18	3	10	2	0.000	0.000	1.000
"	18	2	10	2	0.000	0.000	1.000
"	18	1	10	2	0.000	0.000	1.000
Other WB Arriving and Departing Arrivals	19	1	10	2	0.000	0.000	1.000
"	19	2	10	2	0.000	0.000	1.000
"	19	3	10	2	0.000	0.000	1.000
"	19	4	10	2	0.000	0.000	1.000
"	19	58	10	2	0.000	0.000	1.000
"	19	42	10	2	0.000	0.000	1.000
"	19	43	10	2	0.000	0.000	1.000
"	19	44	10	2	0.000	0.000	1.000
"	19	45	10	2	0.000	0.000	1.000
"	19	46	10	2	0.000	0.000	1.000
"	19	47	10	2	0.500	0.500	0.000
Other WB Arriving and Departing Departures	20	47	10	2	0.000	0.000	1.000
"	20	48	10	2	0.000	0.000	1.000
"	20	49	10	2	0.000	0.000	1.000
"	20	28	10	2	0.000	0.000	1.000
Power Moves Thru EB	21 or 22	12	25	1	0.000	0.000	1.000
"	21 or 22	11	25	1	0.000	0.000	1.000
"	21 or 22	10	25	1	0.000	0.000	1.000
"	21 or 22	9	25	1	0.000	0.000	1.000
"	21 or 22	8	25	1	0.000	0.000	1.000
"	21 or 22	7	25	1	0.000	0.000	1.000
"	21 or 22	6	25	1	0.000	0.000	1.000
"	21 or 22	5	25	1	0.000	0.000	1.000
"	21 or 22	4	25	1	0.000	0.000	1.000
"	21 or 22	3	25	1	0.000	0.000	1.000
"	21 or 22	2	25	1	0.000	0.000	1.000
"	21 or 22	1	25	1	0.000	0.000	1.000
Power Moves Thru WB Arriving	23 or 24	1	25	1	0.000	0.000	1.000
"	23 or 24	2	25	1	0.000	0.000	1.000
"	23 or 24	3	25	1	0.000	0.000	1.000
"	23 or 24	4	25	1	0.000	0.000	1.000
"	23 or 24	5	25	1	0.000	0.000	1.000
"	23 or 24	6	25	1	0.000	0.000	1.000
"	23 or 24	7	25	1	0.000	0.000	1.000
"	23 or 24	8	25	1	0.000	0.000	1.000
"	23 or 24	9	25	1	0.000	0.000	1.000
"	23 or 24	10	25	1	0.000	0.000	1.000
"	23 or 24	11	25	1	0.000	0.000	1.000
"	23 or 24	12	25	1	0.000	0.000	1.000
Power Moves EB Arrivals	25	28	10	2	0.000	0.000	1.000
"	25	49	10	2	0.000	0.000	1.000
"	25	48	10	2	0.000	0.000	1.000
"	25	47	10	2	0.000	0.000	1.000
"	25	46	10	2	0.000	0.000	1.000
"	25	45	10	2	0.000	0.000	1.000
"	25	44	10	2	0.000	0.000	1.000
"	25	43	10	2	0.000	0.000	1.000
"	25	42	10	2	0.000	0.000	1.000
"	25	40	10	2	0.000	0.000	1.000
Power Moves EB Departures	26	1	10	2	0.000	0.000	1.000
"	26	2	10	2	0.000	0.000	1.000
"	26	3	10	2	0.000	0.000	1.000
"	26	4	10	2	0.000	0.000	1.000
"	26	58	10	2	0.000	0.000	1.000
"	26	40	10	2	0.000	0.000	1.000
Power Moves WB Arrivals	27	40	10	2	0.000	0.000	1.000
"	27	58	10	2	0.000	0.000	1.000
"	27	4	10	2	0.000	0.000	1.000
"	27	3	10	2	0.000	0.000	1.000
"	27	2	10	2	0.000	0.000	1.000
"	27	1	10	2	0.000	0.000	1.000
Power Moves WB Departures	28	40	10	2	0.000	0.000	1.000
"	28	42	10	2	0.000	0.000	1.000
"	28	43	10	2	0.000	0.000	1.000
"	28	44	10	2	0.000	0.000	1.000

Movement Type	Activity Code	Segment Number	Speed (mph)	Duty Cycle Number	Non-ZTR Idle Time (hrs)	ZTR Idle Time (hrs)	Fraction of Segment Moving
"	28	45	10	2	0.000	0.000	1.000
"	28	46	10	2	0.000	0.000	1.000
"	28	47	10	2	0.000	0.000	1.000
"	28	48	10	2	0.000	0.000	1.000
"	28	49	10	2	0.000	0.000	1.000
"	28	28	10	2	0.000	0.000	1.000

#### Notes

- (1) Segment numbers listed as negative values are in-yard power moves from arriving trains to service or from service to departing trains
- (2) Non-ZTR Idling is the duration of an idle event when units without ZTR continue to idle after ZTR-equipped units have shut down
- (3) Idling All is the duration of idling during which all locomotives continue to idle
- (4) Fraction of Segment Moving is the fraction of the length of the segment over which the movement occurs  
(On departure, power moves from service are assumed to connect to trains 20% of the way into a track segment)
- (5) All intermodal arriving trains, including those arriving and departing, are assumed to be distributed evenly between the three parts of the intermodal yard (west, center, and east)
- (6) 50% of departing intermodal trains are assumed to depart from the Desert Yard, and the other 50% from the three parts of the intermodal yard
- (7) 50% of other trains arriving or departing are assumed to use the Desert Yard, and the other 50% use the manifest yard (both arrivals and departures)
- (8) All other trains both arriving and departing are assumed to use the manifest yard

Yard Operations	Activity Code	Segment Number	Duty Cycle Number	Non-ZTR		Working Time (hrs)
				Idle Time (hrs)	ZTR Idle Time (hrs)	
Desert Yard	29	13	3	0	0	0.308032
"	29	14	3	0	0	3.969727
"	29	15	3	0	0	0.1179
"	29	16	3	0	0	7.689406
"	29	17	3	0	0	1.864698
"	29	18	3	0	0	2.708776
"	29	19	3	0	0	4.087627
"	29	20	3	0	0	3.253836
Main Yard	30	21	3	0	0	0.685084
"	30	22	3	0	0	0.465883
"	30	23	3	0	0	1.397648
"	30	24	3	0	0	0.465883
"	30	25	3	0	0	0.281196
"	30	26	3	0	0	0.988835
"	30	27	3	0	0	2.085741
"	30	28	3	0	0	0.781185
"	30	29	3	0	0	0.570299
"	30	30	3	0	0	0.536808
"	30	31	3	0	0	1.610423
"	30	32	3	0	0	0.536808
"	30	33	3	0	0	0.910498
"	30	34	3	0	0	0.531774
"	30	35	3	0	0	0.534255
"	30	36	3	0	0	0.423648
"	30	37	3	0	0	0.179116
"	30	38	3	0	0	0.534255
"	30	39	3	0	0	0.731867
"	30	40	3	0	0	0.528516
"	30	41	3	0	0	0.46395
"	30	42	3	0	0	0.502819
"	30	43	3	0	0	1.345005
"	30	44	3	0	0	0.360698
"	30	45	3	0	0	0.479812
"	30	46	3	0	0	1.439435
"	30	47	3	0	0	0.479812
"	30	48	3	0	0	0.42112
"	30	49	3	0	0	0.177878
"	30	50	3	0	0	0.467931
"	30	51	3	0	0	0.541144
"	30	52	3	0	0	0.474237
"	30	53	3	0	0	0.200614
"	30	54	3	0	0	0.204891
"	30	55	3	0	0	0.200889
"	30	56	3	0	0	0.31515
"	30	57	3	0	0	0.144901

Duty Cycles (Percent of Time by Notch)	Number	Duty Cycle									
		Idle	DB	N1	N2	N3	N4	N5	N6	N7	N8
Through Trains and Power Moves	1	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
In Yard Movement	2	0.0%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Yard Switchers	3	59.8%	0.0%	12.4%	12.3%	5.8%	3.6%	3.6%	1.5%	0.2%	0.8%

#### Emission Factors Weighted by Model/Tier/ZTR Fractions - DPM g/hr per Locomotive

Locomotive Model Group	Group ID	Idle-Factors											
		Idle-NonZTR	Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8	
<b>California Fuel (221 ppm S)</b>													
Service	1	18.68	28.71	50.93	45.66	94.77	216.93	277.89	354.94	558.78	644.29	736.71	
LoadTest	2	16.51	24.4	42.6	42.13	86.98	206.92	280.08	351.41	578.43	673.34	759.63	
<b>47-State Fuel (2639 ppm S)</b>													
Service	1	18.68	28.71	50.93	45.66	94.77	235.46	308.84	400.44	625.62	719.56	827.65	
LoadTest	2	16.51	24.4	42.6	42.13	86.98	223.65	311.42	396.93	646.88	747.2	846.4	

Note: Idle-NonZTR is the average per-locomotive idle emission rate for the fraction of locomotives not equipped with ZTR/Auto start-stop technology

#### Service and Shop Activity

Activity	Number of Locomotives	Duration of Activity per Locomotive (minutes)											
		Fraction of Calif. Fuel		Idle-Factors									
		Idle-NonZTR	Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8	
Service - Inbound & Service	4120	0.00	90	30	0	0	0	0	0	0	0	0	
Service - Post Service	4120	0.90	90	30	0	0	0	0	0	0	0	0	
Pre-Maintenance Load Test	7	0.90	0	2	0	0	0	0	0	0	0	8	
Post-Maintenance Load Test	7	0.90	0	2	0	0	0	0	0	0	0	8	
Quarterly Maintenance Load Tes	17	0.90	0	2	0	0	0	0	0	0	0	8	
Unscheduled Mtc Post Test	13	0.90	0	1	0	0	0	0	0	0	0	5	

#### Locomotive Model Distributions

##### Locomotives Serviced

Technology	ZTR/AESS	Switcher	GP-3x	GP-4x	SD-50	GP-60	SD-7x	SD-90	Dash 7	Dash 8	Dash 9	C-60
Pre Tier 0	No	0.0000	0.0119	0.1052	0.0083	0.0241	0.0029	0.0017	0.0002	0.0714	0.0620	0.0002
Pre Tier 0	Yes	0.0119	0.0136	0.0007	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0061	0.0000
Tier 0	No	0.0002	0.0002	0.0041	0.0002	0.0058	0.2529	0.0012	0.0000	0.0141	0.0318	0.0041
Tier 0	Yes	0.0000	0.0036	0.0000	0.0000	0.0005	0.0012	0.0000	0.0000	0.0000	0.0056	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0313	0.0000	0.0000	0.0000	0.0002	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.2167	0.0000	0.0000	0.0000	0.0143	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000
Tier 2	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0270	0.0000	0.0000	0.0000	0.0641	0.0000

**Locomotives Load Tested**

<b>Technology</b>	<b>ZTR/AESS</b>	<b>Switcher</b>	<b>GP-3x</b>	<b>GP-4x</b>	<b>SD-50</b>	<b>GP-60</b>	<b>SD-7x</b>	<b>SD-90</b>	<b>Dash 7</b>	<b>Dash 8</b>	<b>Dash 9</b>	<b>C-60</b>
Pre Tier 0	No	0.0000	0.0556	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0556	0.0556	0.0000
Pre Tier 0	Yes	0.0000	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 0	No	0.0000	0.0556	0.0000	0.0000	0.0000	0.4444	0.0000	0.0000	0.0000	0.0556	0.0000
Tier 0	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0556	0.0000

**Example 1 -- WB Arriving Intermodal Trains**

Parameter	Value
Activity Code	6
Number of Events	1300
Locomotives per Consist on Train	2.279
Locomotives per Consist Working During Power Moves	1.5
Emission Factor Group	2
Fraction of California Fuel	0.00

Route Followed	Segment Number	Length (miles)	Speed (mph)	Power Move	Non-ZTR Idle (hrs)	ZTR Idle (hrs)	Fraction of Segment Moving	Locomotive Hours	Locomotive Hours	Locomotive Hours ZTR
								Moving	NonZTR Idle	Idle
Main Line 1	1	0.149	10	N	0.000	0.000	1.000	44.00	0.00	0.00
Main Line 2	2	0.192	10	N	0.000	0.000	1.000	56.74	0.00	0.00
Main Line 3	3	0.480	10	N	0.000	0.000	1.000	142.18	0.00	0.00
From Main Line to North End of Main Yard	4	0.221	10	N	0.000	0.000	1.000	65.53	0.00	0.00
Main Line Split to Yard North End Split	58	0.382	10	N	0.000	0.000	1.000	113.23	0.00	0.00
IM Yard North End Split to West IM Yard	21	0.170	10	N	0.000	0.000	0.333	16.77	0.00	0.00
North End of West IM Yard	22	0.116	10	N	0.000	0.000	0.333	11.41	0.00	0.00
Center of West IM Yard	23	0.346	10	N	0.000	0.000	0.333	34.21	0.00	0.00
South End of West IM Yard	24	0.116	10	N	0.500	0.167	0.000	0.00	1481.35	493.78
South End of West IM Yard	24	0.116	10	Y	0.000	0.000	0.333	7.51	0.00	0.00
IM Yard South End Split to West IM Yard #2	25	0.070	10	Y	0.000	0.000	0.333	4.53	0.00	0.00
IM Yard South End Split to West IM Yard #1	26	0.245	10	Y	0.000	0.000	0.333	15.92	0.00	0.00
IM Yard South End Split to West IM Yard #1	26	0.245	10	Y	0.000	0.000	1.000	47.78	0.00	0.00
IM Yard South End Split to West IM Yard #2	25	0.070	10	Y	0.000	0.000	1.000	13.59	0.00	0.00
South End of West IM Yard	24	0.116	10	Y	0.000	0.000	1.000	22.52	0.00	0.00
Center of West IM Yard	23	0.346	10	Y	0.000	0.000	1.000	67.55	0.00	0.00
North End of West IM Yard	22	0.116	10	Y	0.000	0.000	1.000	22.52	0.00	0.00
IM Yard North End Split to West IM Yard	21	0.170	10	Y	0.000	0.000	1.000	33.11	0.00	0.00
IM Yard North End Split to Service	40	0.131	10	Y	0.000	0.000	1.000	25.55	0.00	0.00
IM Yard North End Split to Center IM Yard	29	0.141	10	N	0.000	0.000	0.333	13.95	0.00	0.00
North End of Center IM Yard	30	0.133	10	N	0.000	0.000	0.333	13.13	0.00	0.00
Center of Center IM Yard	31	0.399	10	N	0.000	0.000	0.333	39.41	0.00	0.00
South End of Center IM Yard	32	0.133	10	N	0.500	0.167	0.000	0.00	1481.35	493.78
South End of Center IM Yard	32	0.133	10	Y	0.000	0.000	0.333	8.64	0.00	0.00
IM Yard South End Split to Center IM Yard	33	0.226	10	Y	0.000	0.000	0.333	14.66	0.00	0.00
IM Yard North End Split to East IM Yard	34	0.132	10	N	0.000	0.000	0.333	13.02	0.00	0.00
North End of East IM Yard	35	0.132	10	N	0.000	0.000	0.333	13.08	0.00	0.00
Center of East IM Yard #1	36	0.105	10	N	0.000	0.000	0.333	10.37	0.00	0.00
Center of East IM Yard #2	37	0.292	10	N	0.000	0.000	0.333	28.86	0.00	0.00
South End of East IM Yard	38	0.132	10	N	0.500	0.167	0.000	0.00	1481.35	493.78
South End of East IM Yard	38	0.132	10	Y	0.000	0.000	0.333	8.61	0.00	0.00
IM Yard South End Split to East IM Yard	39	0.181	10	Y	0.000	0.000	0.333	11.79	0.00	0.00

Note: Each of the three IM Yards are assumed to handle one third of the arriving IM trains.

Total	920.17	4444.05	1481.35
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Emission Factors	Group ID	Idle- NonZTR										
		Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8	
Arriving IM Trains - CA Fuel	2	16.52	26.61	46.46	47	90.88	219.52	286.79	364.08	573.7	660.36	744.84
Arriving IM Trains - 47-State Fuel	2	16.52	26.61	46.46	47	90.88	238.82	318.68	410.5	642.58	739.23	839.76
CA Fuel Fraction Adjusted Rates		16.52	26.61	46.46	47	90.88	238.82	318.68	410.5	642.58	739.23	839.76
<b>Duty Cycle Moving</b>	2	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
<b>Weighted g/hr emissions</b>		0.00	0.00	0.00	23.50	45.44	0.00	0.00	0.00	0.00	0.00	0.00
		Moving	Idle- NonZTR	Idle-All								
Emission Rate (g/hr)		68.94	16.52	26.61								
Locomotive Hours		920.17	4444.05	1481.35								
<b>Total Emissions (g/yr)</b>		<b>63437</b>	<b>73416</b>	<b>39419</b>								

#### Example 2 -- Quarterly Maintenance Load Testing

Number of Quarterly Maintenance Load Tests	17											
Fraction of Calif. Fuel	0.9											
Emission Factors (g/hr)	Group ID	Idle- NonZTR	Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8
Load Test - CA Fuel	2	16.51	24.40	42.60	42.13	86.98	206.92	280.08	351.41	578.43	673.34	759.63
Load Test - 47-State Fuel	2	16.51	24.4	42.6	42.13	86.98	223.65	311.42	396.93	646.88	747.2	846.4
CA Fuel Fraction Adjusted Rates		16.51	24.40	42.60	42.13	86.98	208.59	283.21	355.96	585.28	680.73	768.31
												Duration (minutes)
Activity	Number of Locomotives	Idle- NonZTR	Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8
Quarterly Maintenance Load Test	17	0	2	0	0	0	0	0	0	0	0	8
<b>Emissions (g)</b>												
Notch-Specific		0.0	13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1741.5
<b>Total Emissions (g/yr)</b>		<b>1755</b>										

**LOCOMOTIVE DATA  
2007 SAMPLE CALCULATIONS**

## Activity Types

Description	Activity Code	Number of Events/Year*	Locomotives per Consist	Emission Factor Group	Locomotives per Consist Working	Fraction of Calif. Fuel
Thru EB Arriving	1	6732	1.170	1	1.170	0.50
Thru EB Departing	2	6732	1.170	1	1.170	0.50
Thru WB Arriving	3	7984	1.187	1	1.187	0.50
Thru WB Departing	4	7984	1.187	1	1.187	0.50
Intermodal Train EB Arrivals	5	107	2.280	2	2.280	0.00
Intermodal Train WB Arrivals	6	1103	2.553	2	2.553	0.00
Intermodal Train EB Departures	7	906	2.223	2	2.223	0.90
Intermodal Train WB Departures	8	394	2.236	2	2.236	0.90
Intermodal EB Arriving and Departing Arrivals	9	255	3.404	2	3.404	0.00
Intermodal EB Arriving and Departing Departures	10	255	2.333	2	2.333	0.00
Intermodal WB Arriving and Departing Arrivals	11	0	1.000	2	1.000	0.00
Intermodal WB Arriving and Departing Departures	12	0	1.000	2	1.000	0.00
Other Train EB Arrivals	13	23	2.304	3	2.304	0.00
Other Train WB Arrivals	14	447	2.586	3	2.586	0.00
Other Train EB Departures	15	395	3.347	3	3.347	0.90
Other Train WB Departures	16	242	2.698	3	2.698	0.90
Other EB Arriving and Departing Arrivals	17	578	2.900	3	2.900	0.00
Other EB Arriving and Departing Departures	18	578	2.611	3	2.611	0.00
Other WB Arriving and Departing Arrivals	19	358	2.201	3	2.201	0.00
Other WB Arriving and Departing Departures	20	358	2.053	3	2.053	0.00
Power Moves Thru EB Arriving	21	151	1.934	1	1.500	0.50
Power Moves Thru EB Departing	22	151	1.901	1	1.500	0.50
Power Moves Thru WB Arriving	23	100	2.780	1	1.500	0.50
Power Moves Thru WB Departing	24	100	2.710	1	1.500	0.50
Power Moves EB Arrivals	25	23	3.077	3	1.500	0.00
Power Moves EB Departures	26	25	3.714	3	1.500	0.00
Power Moves WB Arrivals	27	12	2.583	3	1.500	0.90
Power Moves WB Departures	28	12	2.917	3	1.500	0.90
Yard Switchers -- Desert Yard*	29	364	1.688	4	1.688	1.00
Yard Switchers -- Main Yard*	30	364	1.688	4	1.688	1.00

\* Yard switcher days of operation adjusted to reflect change in trailing tons of freight handled in the yard, relative to 2005.

**Emission Factors Weighted by Model/Tier/ZTR Fractions - DPM g/hr per Locomotive**  
**Idle-**

<b>Consist Groups</b>	<b>Group ID</b>	<b>NonZTR</b>	<b>Idle-All</b>	<b>DB</b>	<b>N1</b>	<b>N2</b>	<b>N3</b>	<b>N4</b>	<b>N5</b>	<b>N6</b>	<b>N7</b>	<b>N8</b>
<b>California Fuel</b>												
Thru Trains and Power Moves												
1	35.33	39.42	70.89	41.53	125.88	216.09	245.35	322.23	488.94	571.72	698.24	
Intermodal Trains	2	11.01	24.39	48.22	45.58	102.41	226.38	280.61	364.34	551.80	643.18	700.86
Other Trains and Power Moves	3	27.83	34.55	63.40	42.79	118.05	218.86	256.60	337.72	507.99	600.00	707.52
Yard Switchers	4	31.00	31.00	56.00	23.00	76.00	128.54	139.25	171.22	270.03	313.39	406.17
<b>47-State Fuel</b>												
Thru Trains and Power Moves	1	35.33	39.42	70.89	41.53	125.88	216.84	246.59	324.11	491.56	574.57	701.72
Intermodal Trains	2	11.01	24.39	48.22	45.58	102.41	227.24	282.02	366.42	554.80	646.65	704.79
Other Trains and Power Moves	3	27.83	34.55	63.40	42.79	118.05	219.64	257.89	339.67	510.72	603.08	711.18
Yard Switchers	4	31.00	31.00	56.00	23.00	76.00	128.54	139.25	171.22	270.03	313.39	406.17

Note: Idle-NonZTR is the average per-locomotive idle emission rate for the fraction of locomotives not equipped with ZTR/Auto start-stop technology

**Locomotive Model Distributions**

**Thru Trains and Power Moves**

<b>Technology</b>	<b>ZTR/AESS</b>	<b>Switcher</b>	<b>GP-3x</b>	<b>GP-4x</b>	<b>SD-50</b>	<b>GP-60</b>	<b>SD-7x</b>	<b>SD-90</b>	<b>Dash 7</b>	<b>Dash 8</b>	<b>Dash 9</b>	<b>C-60</b>
Pre Tier 0	No	0.0000	0.0039	0.8135	0.0002	0.0057	0.0014	0.0002	0.0002	0.0206	0.0358	0.0001
Pre Tier 0	Yes	0.0000	0.0046	0.0002	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0009	0.0000
Tier 0	No	0.0000	0.0005	0.0032	0.0000	0.0025	0.0296	0.0002	0.0000	0.0024	0.0049	0.0000
Tier 0	Yes	0.0000	0.0020	0.0001	0.0000	0.0000	0.0003	0.0001	0.0000	0.0000	0.0009	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0298	0.0000	0.0000	0.0000	0.0025	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
Tier 2	Yes	0.0000	0.0000	0.0002	0.0000	0.0000	0.0099	0.0000	0.0000	0.0000	0.0233	0.0000

**Intermodal Trains**

<b>Technology</b>	<b>ZTR/AESS</b>	<b>Switcher</b>	<b>GP-3x</b>	<b>GP-4x</b>	<b>SD-50</b>	<b>GP-60</b>	<b>SD-7x</b>	<b>SD-90</b>	<b>Dash 7</b>	<b>Dash 8</b>	<b>Dash 9</b>	<b>C-60</b>
Pre Tier 0	No	0.0000	0.0001	0.0303	0.0011	0.0095	0.0012	0.0010	0.0001	0.0103	0.0396	0.0000
Pre Tier 0	Yes	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0123	0.0000
Tier 0	No	0.0000	0.0000	0.0015	0.0000	0.0096	0.2779	0.0010	0.0000	0.0091	0.0348	0.0000
Tier 0	Yes	0.0000	0.0001	0.0000	0.0000	0.0000	0.0008	0.0000	0.0000	0.0000	0.0043	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0031	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.2900	0.0000	0.0000	0.0000	0.0057	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0007	0.0000
Tier 2	Yes	0.0000	0.0000	0.0005	0.0000	0.0000	0.1203	0.0000	0.0000	0.0000	0.1350	0.0000

**Other Trains and Power Moves**

<b>Technology</b>	<b>ZTR/AESS</b>	<b>Switcher</b>	<b>GP-3x</b>	<b>GP-4x</b>	<b>SD-50</b>	<b>GP-60</b>	<b>SD-7x</b>	<b>SD-90</b>	<b>Dash 7</b>	<b>Dash 8</b>	<b>Dash 9</b>	<b>C-60</b>
Pre Tier 0	No	0.0000	0.0054	0.3290	0.0004	0.0116	0.0004	0.0011	0.0000	0.0137	0.0180	0.0000
Pre Tier 0	Yes	0.0000	0.0074	0.0011	0.0000	0.0006	0.0000	0.0000	0.0000	0.0000	0.0030	0.0000
Tier 0	No	0.0000	0.0010	0.0410	0.0000	0.0099	0.1337	0.0013	0.0000	0.0079	0.0206	0.0000
Tier 0	Yes	0.0000	0.0018	0.0000	0.0000	0.0001	0.0006	0.0000	0.0000	0.0000	0.0021	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.1382	0.0000	0.0000	0.0000	0.0131	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000
Tier 2	Yes	0.0000	0.0000	0.0013	0.0000	0.0000	0.0469	0.0000	0.0000	0.0000	0.1879	0.0000

**Yard Switchers**

<b>Technology</b>	<b>ZTR/AESS</b>	<b>Switcher</b>	<b>GP-3x</b>	<b>GP-4x</b>	<b>SD-50</b>	<b>GP-60</b>	<b>SD-7x</b>	<b>SD-90</b>	<b>Dash 7</b>	<b>Dash 8</b>	<b>Dash 9</b>	<b>C-60</b>
Pre Tier 0	No	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pre Tier 0	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 0	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 0	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

<b>Track Segment</b>	<b>Segment Number</b>	<b>Length (mi)</b>
Main Line 1	1	0.149
Main Line 2	2	0.192
Main Line 3	3	0.480
From Main Line to North End of Main Yard	4	0.221
Main Line 5	5	0.146
Main Line 6	6	0.115
Main Line 7	7	0.115
Main Line 8	8	0.147
Main Line 9	9	0.172
Main Line 10	10	0.225
Main Line 11	11	0.547
Main Line 12	12	0.194
North End to Desert Yard North End	13	0.018
North End of Desert Yard #1	14	0.236
North End of Desert Yard #2	15	0.007
North Center of Desert Yard	16	0.457
Center of Desert Yard	17	0.111
South Center of Desert Yard	18	0.161
South End of Desert Yard	19	0.243
Desert Yard to IM Yard North End Split	20	0.193
IM Yard North End Split to West IM Yard	21	0.170
North End of West IM Yard	22	0.116
Center of West IM Yard	23	0.346
South End of West IM Yard	24	0.116
IM Yard South End Split to West IM Yard #2	25	0.070
IM Yard South End Split to West IM Yard #1	26	0.245
IM Yard South End Split to South End Split	27	0.517
South End Split to South End	28	0.194
IM Yard North End Split to Center IM Yard	29	0.141
North End of Center IM Yard	30	0.133
Center of Center IM Yard	31	0.399
South End of Center IM Yard	32	0.133
IM Yard South End Split to Center IM Yard	33	0.226
IM Yard North End Split to East IM Yard	34	0.132
North End of East IM Yard	35	0.132
Center of East IM Yard #1	36	0.105
Center of East IM Yard #2	37	0.292
South End of East IM Yard	38	0.132
IM Yard South End Split to East IM Yard	39	0.181
IM Yard North End Split to Service	40	0.131
Service and Ready Tracks	41	0.115
IM Yard North End Split to Manifest Yard North End #1	42	0.125
IM Yard North End Split to Manifest Yard North End #2	43	0.333
Manifest Yard North End Split to Manifest Yard	44	0.089
Manifest Yard North End	45	0.119
Manifest Yard Center	46	0.357
Manifest Yard South End	47	0.119
Manifest Yard South End to Manifest Yard South End Split	48	0.104

Manifest Yard South End Split to South End Split	49	0.044
South End Split to "Wye"	50	0.116
"Wye" Inlet	51	0.134
"Wye" Leg # 1	52	0.118
"Wye" Leg # 2	53	0.050
"Wye" Leg # 3	54	0.051
"Wye" Leg # 4	55	0.050
"Wye" Leg # 5	56	0.078
"Wye" Leg # 6	57	0.036
Main Line Split to Yard North End Split	58	0.382
Yard Switching - Desert Yard	59	1.204
Yard Switching - Main Yard	60	1.172

\* Note: Approximately 5% of consists for south bound trains use the "Y" to turn to be facing south

Movement Type	Activity Code	Segment Number	Speed (mph)	Duty Cycle Number	Non-ZTR Idle Time (hrs)	ZTR Idle Time (hrs)	Fraction of Segment Moving
Thru EB	1 or 2	1	25	1	0.000	0.000	1.000
"	1 or 2	2	25	1	0.000	0.000	1.000
"	1 or 2	3	25	1	0.000	0.000	1.000
"	1 or 2	4	25	1	0.000	0.000	1.000
"	1 or 2	5	25	1	0.000	0.000	1.000
"	1 or 2	6	25	1	0.000	0.000	1.000
"	1 or 2	7	25	1	0.000	0.000	1.000
"	1 or 2	8	25	1	0.000	0.000	1.000
"	1 or 2	9	25	1	0.000	0.000	1.000
"	1 or 2	10	25	1	0.000	0.000	1.000
"	1 or 2	11	25	1	0.000	0.000	1.000
"	1 or 2	12	25	1	0.000	0.000	1.000
Thru WB	3 or 4	1	25	1	0.000	0.000	1.000
"	3 or 4	2	25	1	0.000	0.000	1.000
"	3 or 4	3	25	1	0.000	0.000	1.000
"	3 or 4	4	25	1	0.000	0.000	1.000
"	3 or 4	5	25	1	0.000	0.000	1.000
"	3 or 4	6	25	1	0.000	0.000	1.000
"	3 or 4	7	25	1	0.000	0.000	1.000
"	3 or 4	8	25	1	0.000	0.000	1.000
"	3 or 4	9	25	1	0.000	0.000	1.000
"	3 or 4	10	25	1	0.000	0.000	1.000
"	3 or 4	11	25	1	0.000	0.000	1.000
"	3 or 4	12	25	1	0.000	0.000	1.000
Intermodal Train EB Arrivals	5	28	10	2	0.000	0.000	1.000
"	5	27	10	2	0.000	0.000	1.000
"	5	26	10	2	0.000	0.000	0.333
"	5	25	10	2	0.000	0.000	0.333
"	5	24	10	2	0.000	0.000	0.333
"	5	23	10	2	0.000	0.000	0.333
"	5	22	10	2	0.500	0.167	0.000
"	5	-22	10	2	0.000	0.000	0.333
"	5	-21	10	2	0.000	0.000	0.333
"	5	33	10	2	0.000	0.000	0.333
"	5	32	10	2	0.000	0.000	0.333
"	5	31	10	2	0.000	0.000	0.333
"	5	30	10	2	0.500	0.167	0.000
"	5	-30	10	2	0.000	0.000	0.333
"	5	-29	10	2	0.000	0.000	0.333
"	5	39	10	2	0.000	0.000	0.333
"	5	38	10	2	0.000	0.000	0.333
"	5	37	10	2	0.000	0.000	0.333

"	5	36	10	2	0.000	0.000	0.333
"	5	35	10	2	0.500	0.167	0.000
"	5	-35	10	2	0.000	0.000	0.333
"	5	-34	10	2	0.000	0.000	0.333
"	5	-40	10	2	0.000	0.000	1.000
Intermodal Train WB Arrivals	6	1	10	2	0.000	0.000	1.000
"	6	2	10	2	0.000	0.000	1.000
"	6	3	10	2	0.000	0.000	1.000
"	6	4	10	2	0.000	0.000	1.000
"	6	58	10	2	0.000	0.000	1.000
"	6	21	10	2	0.000	0.000	0.333
"	6	22	10	2	0.000	0.000	0.333
"	6	23	10	2	0.000	0.000	0.333
"	6	24	10	2	0.500	0.167	0.000
"	6	-24	10	2	0.000	0.000	0.333
"	6	-25	10	2	0.000	0.000	0.333
"	6	-26	10	2	0.000	0.000	0.333
"	6	-26	10	2	0.000	0.000	1.000
"	6	-25	10	2	0.000	0.000	1.000
"	6	-24	10	2	0.000	0.000	1.000
"	6	-23	10	2	0.000	0.000	1.000
"	6	-22	10	2	0.000	0.000	1.000
"	6	-21	10	2	0.000	0.000	1.000
"	6	-40	10	2	0.000	0.000	1.000
"	6	29	10	2	0.000	0.000	0.333
"	6	30	10	2	0.000	0.000	0.333
"	6	31	10	2	0.000	0.000	0.333
"	6	32	10	2	0.500	0.167	0.000
"	6	-32	10	2	0.000	0.000	0.333
"	6	-33	10	2	0.000	0.000	0.333
"	6	34	10	2	0.000	0.000	0.333
"	6	35	10	2	0.000	0.000	0.333
"	6	36	10	2	0.000	0.000	0.333
"	6	37	10	2	0.000	0.000	0.333
"	6	38	10	2	0.500	0.167	0.000
"	6	-38	10	2	0.000	0.000	0.333
"	6	-39	10	2	0.000	0.000	0.333
Intermodal Train EB Departures	7	22	10	2	0.250	0.083	0.167
"	7	21	10	2	0.000	0.000	0.167
"	7	58	10	2	0.000	0.000	0.500
"	7	4	10	2	0.000	0.000	0.500
"	7	3	10	2	0.000	0.000	0.500
"	7	2	10	2	0.000	0.000	0.500
"	7	1	10	2	0.000	0.000	0.500
"	7	30	10	2	0.250	0.083	0.167
"	7	29	10	2	0.000	0.000	0.167

"	7	35	10	2	0.250	0.083	0.167
"	7	34	10	2	0.000	0.000	0.167
"	7	14	10	2	0.750	0.250	0.500
"	7	13	10	2	0.000	0.000	0.500
Intermodal Train WB Departures	8	24	10	2	0.250	0.083	0.167
"	8	25	10	2	0.000	0.000	0.167
"	8	26	10	2	0.000	0.000	0.167
"	8	27	10	2	0.000	0.000	0.500
"	8	28	10	2	0.000	0.000	1.000
"	8	32	10	2	0.250	0.083	0.167
"	8	33	10	2	0.000	0.000	0.167
"	8	38	10	2	0.250	0.083	0.167
"	8	39	10	2	0.000	0.000	0.167
"	8	19	10	2	0.750	0.250	0.500
"	8	20	10	2	0.000	0.000	0.500
"	8	42	10	2	0.000	0.000	0.500
"	8	43	10	2	0.000	0.000	0.500
"	8	44	10	2	0.000	0.000	0.500
"	8	45	10	2	0.000	0.000	0.500
"	8	46	10	2	0.000	0.000	0.500
"	8	47	10	2	0.000	0.000	0.500
"	8	48	10	2	0.000	0.000	0.500
"	8	49	10	2	0.000	0.000	0.500
Intermodal EB Arriving and Departing Arrivals	9	28	10	2	0.000	0.000	1.000
"	9	27	10	2	0.000	0.000	1.000
"	9	26	10	2	0.000	0.000	0.333
"	9	25	10	2	0.000	0.000	0.333
"	9	24	10	2	0.000	0.000	0.333
"	9	23	10	2	0.000	0.000	0.333
"	9	22	10	2	0.167	0.167	0.000
"	9	33	10	2	0.000	0.000	0.333
"	9	32	10	2	0.000	0.000	0.333
"	9	31	10	2	0.000	0.000	0.333
"	9	30	10	2	0.167	0.167	0.000
"	9	39	10	2	0.000	0.000	0.333
"	9	38	10	2	0.000	0.000	0.333
"	9	37	10	2	0.000	0.000	0.333
"	9	36	10	2	0.000	0.000	0.333
"	9	35	10	2	0.167	0.167	0.000
Intermodal EB Arriving and Departing Departures	10	22	10	2	0.000	0.000	0.333
"	10	21	10	2	0.000	0.000	0.333
"	10	58	10	2	0.000	0.000	1.000
"	10	4	10	2	0.000	0.000	1.000
"	10	3	10	2	0.000	0.000	1.000
"	10	2	10	2	0.000	0.000	1.000
"	10	1	10	2	0.000	0.000	1.000

"	10	30	10	2	0.000	0.000	0.333
"	10	29	10	2	0.000	0.000	0.333
"	10	35	10	2	0.000	0.000	0.333
"	10	34	10	2	0.000	0.000	0.333
Intermodal WB Arriving and Departing Arrivals	11	1	10	2	0.000	0.000	1.000
"	11	2	10	2	0.000	0.000	1.000
"	11	3	10	2	0.000	0.000	1.000
"	11	4	10	2	0.000	0.000	1.000
"	11	58	10	2	0.000	0.000	1.000
"	11	21	10	2	0.000	0.000	0.333
"	11	22	10	2	0.000	0.000	0.333
"	11	23	10	2	0.000	0.000	0.333
"	11	24	10	2	0.167	0.167	0.000
"	11	29	10	2	0.000	0.000	0.333
"	11	30	10	2	0.000	0.000	0.333
"	11	31	10	2	0.000	0.000	0.333
"	11	32	10	2	0.167	0.167	0.000
"	11	34	10	2	0.000	0.000	0.333
"	11	35	10	2	0.000	0.000	0.333
"	11	36	10	2	0.000	0.000	0.333
"	11	37	10	2	0.000	0.000	0.333
"	11	38	10	2	0.167	0.167	0.000
Intermodal WB Arriving and Departing Departures	12	24	10	2	0.000	0.000	0.333
"	12	25	10	2	0.000	0.000	0.333
"	12	26	10	2	0.000	0.000	0.333
"	12	27	10	2	0.000	0.000	1.000
"	12	28	10	2	0.000	0.000	1.000
"	12	32	10	2	0.000	0.000	0.333
"	12	33	10	2	0.000	0.000	0.333
"	12	38	10	2	0.000	0.000	0.333
"	12	39	10	2	0.000	0.000	0.333
Other Train EB Arrivals	13	28	10	2	0.000	0.000	1.000
"	13	49	10	2	0.000	0.000	1.000
"	13	48	10	2	0.000	0.000	1.000
"	13	47	10	2	0.000	0.000	1.000
"	13	46	10	2	0.000	0.000	1.000
"	13	45	10	2	0.750	0.250	0.000
"	13	-45	10	2	0.000	0.000	0.500
"	13	-44	10	2	0.000	0.000	0.500
"	13	-43	10	2	0.000	0.000	0.500
"	13	-42	10	2	0.000	0.000	0.500
"	13	-40	10	2	0.000	0.000	0.500
"	13	45	10	2	0.000	0.000	0.500
"	13	44	10	2	0.000	0.000	0.500
"	13	43	10	2	0.000	0.000	0.500
"	13	42	10	2	0.000	0.000	0.500

"	13	20	10	2	0.000	0.000	0.500
"	13	19	10	2	0.000	0.000	0.500
"	13	18	10	2	0.000	0.000	0.500
"	13	17	10	2	0.000	0.000	0.500
"	13	16	10	2	0.000	0.000	0.500
"	13	15	10	2	0.000	0.000	0.500
"	13	14	10	2	0.750	0.250	0.000
"	13	-14	10	2	0.000	0.000	0.500
"	13	-14	10	2	0.000	0.000	0.500
"	13	-15	10	2	0.000	0.000	0.500
"	13	-16	10	2	0.000	0.000	0.500
"	13	-17	10	2	0.000	0.000	0.500
"	13	-18	10	2	0.000	0.000	0.500
"	13	-19	10	2	0.000	0.000	0.500
"	13	-20	10	2	0.000	0.000	0.500
"	13	-40	10	2	0.000	0.000	0.500
Other Train WB Arrivals	14	13	10	2	0.000	0.000	0.500
"	14	14	10	2	0.000	0.000	0.500
"	14	15	10	2	0.000	0.000	0.500
"	14	16	10	2	0.000	0.000	0.500
"	14	17	10	2	0.000	0.000	0.500
"	14	18	10	2	0.000	0.000	0.500
"	14	19	10	2	0.750	0.250	0.000
"	14	-19	10	2	0.000	0.000	0.500
"	14	-20	10	2	0.000	0.000	0.500
"	14	-40	10	2	0.000	0.000	1.000
"	14	1	10	2	0.000	0.000	0.500
"	14	2	10	2	0.000	0.000	0.500
"	14	3	10	2	0.000	0.000	0.500
"	14	4	10	2	0.000	0.000	0.500
"	14	58	10	2	0.000	0.000	0.500
"	14	42	10	2	0.000	0.000	0.500
"	14	43	10	2	0.000	0.000	0.500
"	14	44	10	2	0.000	0.000	0.500
"	14	45	10	2	0.000	0.000	0.500
"	14	46	10	2	0.000	0.000	0.500
"	14	47	10	2	0.750	0.250	0.000
"	14	-47	10	2	0.000	0.000	0.500
"	14	-48	10	2	0.000	0.000	0.500
"	14	-48	10	2	0.000	0.000	0.500
"	14	-47	10	2	0.000	0.000	0.500
"	14	-46	10	2	0.000	0.000	0.500
"	14	-45	10	2	0.000	0.000	0.500
"	14	-44	10	2	0.000	0.000	0.500
"	14	-43	10	2	0.000	0.000	0.500
"	14	-42	10	2	0.000	0.000	0.500

Other Train EB Departures	15	14	10	2	0.750	0.250	0.500
"	15	13	10	2	0.000	0.000	0.500
"	15	45	10	2	0.750	0.250	0.500
"	15	44	10	2	0.000	0.000	0.500
"	15	43	10	2	0.000	0.000	0.500
"	15	42	10	2	0.000	0.000	0.500
"	15	58	10	2	0.000	0.000	0.500
"	15	4	10	2	0.000	0.000	0.500
"	15	3	10	2	0.000	0.000	0.500
"	15	2	10	2	0.000	0.000	0.500
"	15	1	10	2	0.000	0.000	0.500
Other Train WB Departures	16	19	10	2	0.750	0.250	0.500
"	16	20	10	2	0.000	0.000	0.500
"	16	42	10	2	0.000	0.000	0.500
"	16	43	10	2	0.000	0.000	0.500
"	16	44	10	2	0.000	0.000	0.500
"	16	45	10	2	0.000	0.000	0.500
"	16	46	10	2	0.000	0.000	0.500
"	16	47	10	2	0.000	0.000	0.500
"	16	48	10	2	0.000	0.000	0.500
"	16	49	10	2	0.000	0.000	0.500
"	16	28	10	2	0.000	0.000	1.000
"	16	47	10	2	0.750	0.250	0.500
"	16	48	10	2	0.000	0.000	0.500
"	16	49	10	2	0.000	0.000	0.500
Other EB Arriving and Departing Arrivals	17	28	10	2	0.000	0.000	1.000
"	17	49	10	2	0.000	0.000	1.000
"	17	48	10	2	0.000	0.000	1.000
"	17	47	10	2	0.000	0.000	1.000
"	17	46	10	2	0.000	0.000	1.000
"	17	45	10	2	0.500	0.500	0.000
Other EB Arriving and Departing Departures	18	45	10	2	0.000	0.000	1.000
"	18	44	10	2	0.000	0.000	1.000
"	18	43	10	2	0.000	0.000	1.000
"	18	42	10	2	0.000	0.000	1.000
"	18	58	10	2	0.000	0.000	1.000
"	18	4	10	2	0.000	0.000	1.000
"	18	3	10	2	0.000	0.000	1.000
"	18	2	10	2	0.000	0.000	1.000
"	18	1	10	2	0.000	0.000	1.000
Other WB Arriving and Departing Arrivals	19	1	10	2	0.000	0.000	1.000
"	19	2	10	2	0.000	0.000	1.000
"	19	3	10	2	0.000	0.000	1.000
"	19	4	10	2	0.000	0.000	1.000
"	19	58	10	2	0.000	0.000	1.000
"	19	42	10	2	0.000	0.000	1.000

"	19	43	10	2	0.000	0.000	1.000
"	19	44	10	2	0.000	0.000	1.000
"	19	45	10	2	0.000	0.000	1.000
"	19	46	10	2	0.000	0.000	1.000
"	19	47	10	2	0.500	0.500	0.000
Other WB Arriving and Departing Departures	20	47	10	2	0.000	0.000	1.000
"	20	48	10	2	0.000	0.000	1.000
"	20	49	10	2	0.000	0.000	1.000
"	20	28	10	2	0.000	0.000	1.000
Power Moves Thru EB	21 or 22	12	25	1	0.000	0.000	1.000
"	21 or 22	11	25	1	0.000	0.000	1.000
"	21 or 22	10	25	1	0.000	0.000	1.000
"	21 or 22	9	25	1	0.000	0.000	1.000
"	21 or 22	8	25	1	0.000	0.000	1.000
"	21 or 22	7	25	1	0.000	0.000	1.000
"	21 or 22	6	25	1	0.000	0.000	1.000
"	21 or 22	5	25	1	0.000	0.000	1.000
"	21 or 22	4	25	1	0.000	0.000	1.000
"	21 or 22	3	25	1	0.000	0.000	1.000
"	21 or 22	2	25	1	0.000	0.000	1.000
"	21 or 22	1	25	1	0.000	0.000	1.000
Power Moves Thru WB Arriving	23 or 24	1	25	1	0.000	0.000	1.000
"	23 or 24	2	25	1	0.000	0.000	1.000
"	23 or 24	3	25	1	0.000	0.000	1.000
"	23 or 24	4	25	1	0.000	0.000	1.000
"	23 or 24	5	25	1	0.000	0.000	1.000
"	23 or 24	6	25	1	0.000	0.000	1.000
"	23 or 24	7	25	1	0.000	0.000	1.000
"	23 or 24	8	25	1	0.000	0.000	1.000
"	23 or 24	9	25	1	0.000	0.000	1.000
"	23 or 24	10	25	1	0.000	0.000	1.000
"	23 or 24	11	25	1	0.000	0.000	1.000
"	23 or 24	12	25	1	0.000	0.000	1.000
Power Moves EB Arrivals	25	28	10	2	0.000	0.000	1.000
"	25	49	10	2	0.000	0.000	1.000
"	25	48	10	2	0.000	0.000	1.000
"	25	47	10	2	0.000	0.000	1.000
"	25	46	10	2	0.000	0.000	1.000
"	25	45	10	2	0.000	0.000	1.000
"	25	44	10	2	0.000	0.000	1.000
"	25	43	10	2	0.000	0.000	1.000
"	25	42	10	2	0.000	0.000	1.000
"	25	40	10	2	0.000	0.000	1.000
Power Moves EB Departures	26	1	10	2	0.000	0.000	1.000
"	26	2	10	2	0.000	0.000	1.000
"	26	3	10	2	0.000	0.000	1.000

"	26	4	10	2	0.000	0.000	1.000
"	26	58	10	2	0.000	0.000	1.000
"	26	40	10	2	0.000	0.000	1.000
Power Moves WB Arrivals	27	40	10	2	0.000	0.000	1.000
"	27	58	10	2	0.000	0.000	1.000
"	27	4	10	2	0.000	0.000	1.000
"	27	3	10	2	0.000	0.000	1.000
"	27	2	10	2	0.000	0.000	1.000
"	27	1	10	2	0.000	0.000	1.000
Power Moves WB Departures	28	40	10	2	0.000	0.000	1.000
"	28	42	10	2	0.000	0.000	1.000
"	28	43	10	2	0.000	0.000	1.000
"	28	44	10	2	0.000	0.000	1.000
"	28	45	10	2	0.000	0.000	1.000
"	28	46	10	2	0.000	0.000	1.000
"	28	47	10	2	0.000	0.000	1.000
"	28	48	10	2	0.000	0.000	1.000
"	28	49	10	2	0.000	0.000	1.000
"	28	28	10	2	0.000	0.000	1.000

#### Notes

- (1) Segment numbers listed as negative values are in-yard power moves from arriving trains to service or from service to departing trains
- (2) Non-ZTR Idling is the duration of an idle event when units without ZTR continue to idle after ZTR-equipped units have shut down
- (3) Idling All is the duration of idling during which all locomotives continue to idle
- (4) Fraction of Segment Moving is the fraction of the length of the segment over which the movement occurs  
(On departure, power moves from service are assumed to connect to trains 20% of the way into a track segment)
- (5) All intermodal arriving trains, including those arriving and departing, are assumed to be distributed evenly between the three parts of the intermodal yard (west, center, and east)
- (6) 50% of departing intermodal trains are assumed to depart from the Desert Yard, and the other 50% from the three parts of the intermodal yard
- (7) 50% of other trains arriving or departing are assumed to use the Desert Yard, and the other 50% use the manifest yard (both arrivals and departures)
- (8) All other trains both arriving and departing are assumed to use the manifest yard

Yard Operations	Activity	Segment	Duty	Non-ZTR		Working Time
			Cycle	Idle Time	ZTR Idle Time	
	Code	Number	Number	(hrs)	(hrs)	(hrs)
Desert Yard	29	13	3	0	0	0.308032
"	29	14	3	0	0	3.969727
"	29	15	3	0	0	0.1179
"	29	16	3	0	0	7.689406
"	29	17	3	0	0	1.864698
"	29	18	3	0	0	2.708776
"	29	19	3	0	0	4.087627
"	29	20	3	0	0	3.253836
Main Yard	30	21	3	0	0	0.685084

"	30	22	3	0	0	0.465883
"	30	23	3	0	0	1.397648
"	30	24	3	0	0	0.465883
"	30	25	3	0	0	0.281196
"	30	26	3	0	0	0.988835
"	30	27	3	0	0	2.085741
"	30	28	3	0	0	0.781185
"	30	29	3	0	0	0.570299
"	30	30	3	0	0	0.536808
"	30	31	3	0	0	1.610423
"	30	32	3	0	0	0.536808
"	30	33	3	0	0	0.910498
"	30	34	3	0	0	0.531774
"	30	35	3	0	0	0.534255
"	30	36	3	0	0	0.423648
"	30	37	3	0	0	1.179116
"	30	38	3	0	0	0.534255
"	30	39	3	0	0	0.731867
"	30	40	3	0	0	0.528516
"	30	41	3	0	0	0.46395
"	30	42	3	0	0	0.502819
"	30	43	3	0	0	1.345005
"	30	44	3	0	0	0.360698
"	30	45	3	0	0	0.479812
"	30	46	3	0	0	1.439435
"	30	47	3	0	0	0.479812
"	30	48	3	0	0	0.42112
"	30	49	3	0	0	0.177878
"	30	50	3	0	0	0.467931
"	30	51	3	0	0	0.541144
"	30	52	3	0	0	0.474237
"	30	53	3	0	0	0.200614
"	30	54	3	0	0	0.204891
"	30	55	3	0	0	0.200889
"	30	56	3	0	0	0.31515
"	30	57	3	0	0	0.144901

Duty Cycles (Percent of Time by Notch)	
Through Trains and Power Moves	
In Yard Movement	
Yard Switchers	

Duty Cycle Number	Idle	DB	N1	N2	N3	N4	N5	N6	N7	N8
1	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	0.0%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3	59.8%	0.0%	12.4%	12.3%	5.8%	3.6%	3.6%	1.5%	0.2%	0.8%

**Emission Factors Weighted by Model/Tier/ZTR Fractions - DPM g/hr per Locomotive**

Locomotive Model Group	Group ID	Idle-Factors											
		Idle-NonZTR	Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8	
<b>California Fuel</b>													
Service	1	11.9	24.83	43.74	44.13	97.28	219.17	280.21	354.13	555.4	647.35	725.93	
LoadTest	2	1.64	31.42	58.44	33.95	105.08	198.98	227.26	273.65	464.19	551.03	644.66	
<b>47-State Fuel</b>													
Service	1	11.9	24.83	43.74	44.13	97.28	229.23	297.48	379.36	591.98	688.11	773.66	
LoadTest	2	1.64	31.42	58.44	33.95	105.08	205.47	241.55	294.75	493.14	575.67	674.11	

Note: Idle-NonZTR is the average per-locomotive idle emission rate for the fraction of locomotives not equipped with ZTR/Auto start-stop technology

**Service and Shop Activity**

Activity	Number of Locomotives	Fraction of Calif. Fuel	Duration of Activity per Locomotive (minutes)										
			Idle-Factors			Duration of Activity per Locomotive (minutes)							
			Idle-NonZTR	Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8
Service - Inbound & Service	4653	0.00	90	30	0	0	0	0	0	0	0	0	0
Service - Post Service	4653	0.90	90	30	0	0	0	0	0	0	0	0	0
Pre-Maintenance Load Test	5	0.90	0	2	0	0	0	0	0	0	0	0	8
Post-Maintenance Load Test	5	0.90	0	2	0	0	0	0	0	0	0	0	8
Quarterly Maintenance Load Test	10	0.90	0	2	0	0	0	0	0	0	0	0	8
Unscheduled Mtc Post Test	4	0.90	0	1	0	0	0	0	0	0	0	0	5

**Locomotive Model Distributions**

**Locomotives Serviced**

Technology	ZTR/AESS	Switcher	GP-3x	GP-4x	SD-50	GP-60	SD-7x	SD-90	Dash 7	Dash 8	Dash 9	C-60
Pre Tier 0	No	0.0000	0.0007	0.0821	0.0002	0.0110	0.0019	0.0013	0.0000	0.0142	0.0267	0.0000
Pre Tier 0	Yes	0.0052	0.0247	0.0015	0.0000	0.0013	0.0000	0.0000	0.0000	0.0000	0.0095	0.0000
Tier 0	No	0.0000	0.0000	0.0054	0.0000	0.0125	0.2423	0.0015	0.0000	0.0112	0.0357	0.0000
Tier 0	Yes	0.0039	0.0058	0.0000	0.0000	0.0004	0.0009	0.0000	0.0000	0.0000	0.0039	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0022	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.2458	0.0000	0.0000	0.0000	0.0108	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0007	0.0000	0.0000	0.0000	0.0004	0.0000
Tier 2	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.1023	0.0000	0.0000	0.0000	0.1344	0.0000

**Locomotives Load Tested**

<b>Technology</b>	<b>ZTR/AESS</b>	<b>Switcher</b>	<b>GP-3x</b>	<b>GP-4x</b>	<b>SD-50</b>	<b>GP-60</b>	<b>SD-7x</b>	<b>SD-90</b>	<b>Dash 7</b>	<b>Dash 8</b>	<b>Dash 9</b>	<b>C-60</b>
<b>Pre Tier 0</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Pre Tier 0</b>	<b>Yes</b>	0.0000	0.5556	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 0</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 0</b>	<b>Yes</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 1</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 1</b>	<b>Yes</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 2</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 2</b>	<b>Yes</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.2222	0.0000	0.0000	0.0000	0.0000	0.0000

**Example 1 -- WB Arriving Intermodal Trains**

Parameter	Value
Activity Code	6
Number of Events	1103
Locomotives per Consist on Train	2.553
Locomotives per Consist Working During Power Moves	1.5
Emission Factor Group	2
Fraction of California Fuel	0.00

Route Followed	Segment Number	Length (miles)	Speed (mph)	Power Move	Non-ZTR Idle (hrs)	ZTR Idle (hrs)	Fraction of Segment	Locomotive Hours Moving	Locomotive Hours NonZTR	Locomotive Hours Idle	Locomotive Hours ZTR
							Moving	Moving	Idle	ZTR	
Main Line 1	1	0.149	10	N	0.000	0.000	1.000	41.82	0.00	0.00	0.00
Main Line 2	2	0.192	10	N	0.000	0.000	1.000	53.93	0.00	0.00	0.00
Main Line 3	3	0.480	10	N	0.000	0.000	1.000	135.14	0.00	0.00	0.00
From Main Line to North End of Main Yard	4	0.221	10	N	0.000	0.000	1.000	62.29	0.00	0.00	0.00
Main Line Split to Yard North End Split	58	0.382	10	N	0.000	0.000	1.000	107.63	0.00	0.00	0.00
IM Yard North End Split to West IM Yard	21	0.170	10	N	0.000	0.000	0.333	15.94	0.00	0.00	0.00
North End of West IM Yard	22	0.116	10	N	0.000	0.000	0.333	10.84	0.00	0.00	0.00
Center of West IM Yard	23	0.346	10	N	0.000	0.000	0.333	32.51	0.00	0.00	0.00
South End of West IM Yard	24	0.116	10	N	0.500	0.167	0.000	0.00	1407.98	469.33	0.00
South End of West IM Yard	24	0.116	10	Y	0.000	0.000	0.333	6.37	0.00	0.00	0.00
IM Yard South End Split to West IM Yard #2	25	0.070	10	Y	0.000	0.000	0.333	3.84	0.00	0.00	0.00
IM Yard South End Split to West IM Yard #1	26	0.245	10	Y	0.000	0.000	0.333	13.51	0.00	0.00	0.00
IM Yard South End Split to West IM Yard #1	26	0.245	10	Y	0.000	0.000	1.000	40.54	0.00	0.00	0.00
IM Yard South End Split to West IM Yard #2	25	0.070	10	Y	0.000	0.000	1.000	11.53	0.00	0.00	0.00
South End of West IM Yard	24	0.116	10	Y	0.000	0.000	1.000	19.11	0.00	0.00	0.00
Center of West IM Yard	23	0.346	10	Y	0.000	0.000	1.000	57.31	0.00	0.00	0.00
North End of West IM Yard	22	0.116	10	Y	0.000	0.000	1.000	19.11	0.00	0.00	0.00
IM Yard North End Split to West IM Yard	21	0.170	10	Y	0.000	0.000	1.000	28.09	0.00	0.00	0.00
IM Yard North End Split to Service	40	0.131	10	Y	0.000	0.000	1.000	21.67	0.00	0.00	0.00
IM Yard North End Split to Center IM Yard	29	0.141	10	N	0.000	0.000	0.333	13.26	0.00	0.00	0.00
North End of Center IM Yard	30	0.133	10	N	0.000	0.000	0.333	12.48	0.00	0.00	0.00
Center of Center IM Yard	31	0.399	10	N	0.000	0.000	0.333	37.46	0.00	0.00	0.00
South End of Center IM Yard	32	0.133	10	N	0.500	0.167	0.000	0.00	1407.98	469.33	0.00
South End of Center IM Yard	32	0.133	10	Y	0.000	0.000	0.333	7.33	0.00	0.00	0.00
IM Yard South End Split to Center IM Yard	33	0.226	10	Y	0.000	0.000	0.333	12.44	0.00	0.00	0.00
IM Yard North End Split to East IM Yard	34	0.132	10	N	0.000	0.000	0.333	12.37	0.00	0.00	0.00
North End of East IM Yard	35	0.132	10	N	0.000	0.000	0.333	12.43	0.00	0.00	0.00
Center of East IM Yard #1	36	0.105	10	N	0.000	0.000	0.333	9.86	0.00	0.00	0.00
Center of East IM Yard #2	37	0.292	10	N	0.000	0.000	0.333	27.43	0.00	0.00	0.00
South End of East IM Yard	38	0.132	10	N	0.500	0.167	0.000	0.00	1407.98	469.33	0.00
South End of East IM Yard	38	0.132	10	Y	0.000	0.000	0.333	7.30	0.00	0.00	0.00
IM Yard South End Split to East IM Yard	39	0.181	10	Y	0.000	0.000	0.333	10.00	0.00	0.00	0.00

Note: Each of the three IM Yards are assumed to handle one third of the arriving IM trains.

Total	843.56	4223.94	1407.98
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#### **Example 2 -- Quarterly Maintenance Load Testing**

**LOCOMOTIVE DATA  
2010 SAMPLE CALCULATIONS**

## Activity Types

Description	Activity Code	Number of Events/Year*	Locomotives per Consist	Emission Factor Group	Locomotives per Consist Working	Fraction of Calif. Fuel
Thru EB Arriving	1	6686	1.170	1	1.170	0.50
Thru EB Departing	2	6686	1.170	1	1.170	0.50
Thru WB Arriving	3	7929	1.187	1	1.187	0.50
Thru WB Departing	4	7929	1.187	1	1.187	0.50
Intermodal Train EB Arrivals	5	107	2.280	2	2.280	0.00
Intermodal Train WB Arrivals	6	1101	2.553	2	2.553	0.00
Intermodal Train EB Departures	7	904	2.223	2	2.223	0.90
Intermodal Train WB Departures	8	393	2.236	2	2.236	0.90
Intermodal EB Arriving and Departing Arrivals	9	255	3.404	2	3.404	0.00
Intermodal EB Arriving and Departing Departures	10	255	2.333	2	2.333	0.00
Intermodal WB Arriving and Departing Arrivals	11	0	1.000	2	1.000	0.00
Intermodal WB Arriving and Departing Departures	12	0	1.000	2	1.000	0.00
Other Train EB Arrivals	13	23	2.304	3	2.304	0.00
Other Train WB Arrivals	14	442	2.586	3	2.586	0.00
Other Train EB Departures	15	390	3.347	3	3.347	0.90
Other Train WB Departures	16	239	2.698	3	2.698	0.90
Other EB Arriving and Departing Arrivals	17	571	2.900	3	2.900	0.00
Other EB Arriving and Departing Departures	18	571	2.611	3	2.611	0.00
Other WB Arriving and Departing Arrivals	19	354	2.201	3	2.201	0.00
Other WB Arriving and Departing Departures	20	354	2.053	3	2.053	0.00
Power Moves Thru EB Arriving	21	150	1.934	1	1.500	0.50
Power Moves Thru EB Departing	22	150	1.901	1	1.500	0.50
Power Moves Thru WB Arriving	23	99	2.780	1	1.500	0.50
Power Moves Thru WB Departing	24	99	2.710	1	1.500	0.50
Power Moves EB Arrivals	25	23	3.077	3	1.500	0.00
Power Moves EB Departures	26	25	3.714	3	1.500	0.00
Power Moves WB Arrivals	27	14	2.583	3	1.500	0.90
Power Moves WB Departures	28	14	2.917	3	1.500	0.90
Yard Switchers -- Desert Yard	29	364	1.688	4	1.688	1.00
Yard Switchers -- Main Yard	30	364	1.688	4	1.688	1.00

\* - Number of events per year adjusted from 2007 based on projected change in working hp per consist for each train type (i.e., maintain constant working hp per trailing ton based on projected changes in locomotive fleet composition).

**Emission Factors Weighted by Model/Tier/ZTR Fractions - DPM g/hr per Locomotive**

Consist Groups	Group ID	Idle-										
		NonZTR	Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8
<b>California Fuel</b>												
Thru Trains and Power Moves	1	41.23	43.47	75.28	38.75	129.25	213.26	236.16	305.48	488.51	577.97	721.90
Intermodal Trains	2	10.17	23.81	42.33	43.56	97.79	223.16	282.61	374.06	574.60	666.85	722.75
Other Trains and Power Moves	3	24.10	32.06	58.06	43.71	114.82	218.75	262.28	355.57	519.35	597.44	689.07
Yard Switchers	4	31.00	31.00	56.00	23.00	76.00	128.54	139.25	171.22	270.03	313.39	406.17
<b>47-State Fuel</b>												
Thru Trains and Power Moves	1	41.23	43.47	75.28	38.75	129.25	215.03	239.41	310.48	495.42	584.75	730.41
Intermodal Trains	2	10.17	23.81	42.33	43.56	97.79	225.38	286.45	379.88	582.99	676.22	733.19
Other Trains and Power Moves	3	24.10	32.06	58.06	43.71	114.82	221.01	265.83	361.02	527.04	606.46	699.54
Yard Switchers	4	31.00	31.00	56.00	23.00	76.00	128.54	139.25	171.22	270.03	313.39	406.17

Note: Idle-NonZTR is the average per-locomotive idle emission rate for the fraction of locomotives not equipped with ZTR/Auto start-stop technology

**Locomotive Model Distributions**

**Thru Trains and Power Moves**

Technology	ZTR/AESS	Switcher	GP-3x	GP-4x	SD-50	GP-60	SD-7x	SD-90	Dash 7	Dash 8	Dash 9	C-60
Pre Tier 0	No	0.0000	0.0000	0.5563	0.0001	0.0015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pre Tier 0	Yes	0.0000	0.0046	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 0	No	0.0000	0.0000	0.2465	0.0000	0.0068	0.0286	0.0005	0.0000	0.0196	0.0400	0.0001
Tier 0	Yes	0.0000	0.0054	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	Yes	0.0000	0.0004	0.0000	0.0000	0.0000	0.0281	0.0000	0.0000	0.0000	0.0134	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	Yes	0.0000	0.0001	0.0000	0.0000	0.0000	0.0253	0.0000	0.0000	0.0000	0.0229	0.0000

**Intermodal Trains**

Technology	ZTR/AESS	Switcher	GP-3x	GP-4x	SD-50	GP-60	SD-7x	SD-90	Dash 7	Dash 8	Dash 9	C-60
Pre Tier 0	No	0.0000	0.0000	0.0195	0.0005	0.0030	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pre Tier 0	Yes	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 0	No	0.0000	0.0000	0.0087	0.0000	0.0138	0.2467	0.0017	0.0000	0.0146	0.1207	0.0000
Tier 0	Yes	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.2427	0.0000	0.0000	0.0000	0.0404	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	Yes	0.0000	0.0000	0.0000	0.0000	0.0000	0.2185	0.0000	0.0000	0.0000	0.0691	0.0000

**Other Trains and Power Moves**

Technology	ZTR/AESS	Switcher	<b>GP-3x</b>	<b>GP-4x</b>	<b>SD-50</b>	<b>GP-60</b>	<b>SD-7x</b>	<b>SD-90</b>	<b>Dash 7</b>	<b>Dash 8</b>	<b>Dash 9</b>	<b>C-60</b>
<b>Pre Tier 0</b>	<b>No</b>	0.0000	0.0000	0.2379	0.0002	0.0036	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Pre Tier 0</b>	<b>Yes</b>	0.0000	0.0062	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 0</b>	<b>No</b>	0.0000	0.0000	0.1054	0.0000	0.0169	0.1206	0.0022	0.0000	0.0173	0.1345	0.0000
<b>Tier 0</b>	<b>Yes</b>	0.0000	0.0072	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 1</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 1</b>	<b>Yes</b>	0.0000	0.0005	0.0000	0.0000	0.0000	0.1186	0.0000	0.0000	0.0000	0.0451	0.0000
<b>Tier 2</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 2</b>	<b>Yes</b>	0.0000	0.0002	0.0000	0.0000	0.0000	0.1068	0.0000	0.0000	0.0000	0.0770	0.0000

**Yard Switchers**

Technology	ZTR/AESS	Switcher	<b>GP-3x</b>	<b>GP-4x</b>	<b>SD-50</b>	<b>GP-60</b>	<b>SD-7x</b>	<b>SD-90</b>	<b>Dash 7</b>	<b>Dash 8</b>	<b>Dash 9</b>	<b>C-60</b>
<b>Pre Tier 0</b>	<b>No</b>	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Pre Tier 0</b>	<b>Yes</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 0</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 0</b>	<b>Yes</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 1</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 1</b>	<b>Yes</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 2</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 2</b>	<b>Yes</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

<b>Track Segment</b>	<b>Segment Number</b>	<b>Length (mi)</b>
Main Line 1	1	0.149
Main Line 2	2	0.192
Main Line 3	3	0.480
From Main Line to North End of Main Yard	4	0.221
Main Line 5	5	0.146
Main Line 6	6	0.115
Main Line 7	7	0.115
Main Line 8	8	0.147
Main Line 9	9	0.172
Main Line 10	10	0.225
Main Line 11	11	0.547
Main Line 12	12	0.194
North End to Desert Yard North End	13	0.018
North End of Desert Yard #1	14	0.236
North End of Desert Yard #2	15	0.007
North Center of Desert Yard	16	0.457
Center of Desert Yard	17	0.111
South Center of Desert Yard	18	0.161
South End of Desert Yard	19	0.243
Desert Yard to IM Yard North End Split	20	0.193
IM Yard North End Split to West IM Yard	21	0.170
North End of West IM Yard	22	0.116
Center of West IM Yard	23	0.346
South End of West IM Yard	24	0.116
IM Yard South End Split to West IM Yard #2	25	0.070
IM Yard South End Split to West IM Yard #1	26	0.245
IM Yard South End Split to South End Split	27	0.517
South End Split to South End	28	0.194
IM Yard North End Split to Center IM Yard	29	0.141
North End of Center IM Yard	30	0.133
Center of Center IM Yard	31	0.399
South End of Center IM Yard	32	0.133
IM Yard South End Split to Center IM Yard	33	0.226
IM Yard North End Split to East IM Yard	34	0.132
North End of East IM Yard	35	0.132
Center of East IM Yard #1	36	0.105
Center of East IM Yard #2	37	0.292
South End of East IM Yard	38	0.132
IM Yard South End Split to East IM Yard	39	0.181
IM Yard North End Split to Service	40	0.131
Service and Ready Tracks	41	0.115
IM Yard North End Split to Manifest Yard North End #1	42	0.125
IM Yard North End Split to Manifest Yard North End #2	43	0.333
Manifest Yard North End Split to Manifest Yard	44	0.089
Manifest Yard North End	45	0.119
Manifest Yard Center	46	0.357
Manifest Yard South End	47	0.119
Manifest Yard South End to Manifest Yard South End Split	48	0.104

Manifest Yard South End Split to South End Split	49	0.044
South End Split to "Wye"	50	0.116
"Wye" Inlet	51	0.134
"Wye" Leg # 1	52	0.118
"Wye" Leg # 2	53	0.050
"Wye" Leg # 3	54	0.051
"Wye" Leg # 4	55	0.050
"Wye" Leg # 5	56	0.078
"Wye" Leg # 6	57	0.036
Main Line Split to Yard North End Split	58	0.382
Yard Switching - Desert Yard	59	1.204
Yard Switching - Main Yard	60	1.172

\* Note: Approximately 5% of consists for south bound trains use the "Y" to turn to be facing south

Movement Type	Activity Code	Segment Number	Speed (mph)	Duty Cycle Number	Non-ZTR Idle Time (hrs)	ZTR Idle Time (hrs)	Fraction of Segment Moving
Thru EB	1 or 2	1	25	1	0.000	0.000	1.000
"	1 or 2	2	25	1	0.000	0.000	1.000
"	1 or 2	3	25	1	0.000	0.000	1.000
"	1 or 2	4	25	1	0.000	0.000	1.000
"	1 or 2	5	25	1	0.000	0.000	1.000
"	1 or 2	6	25	1	0.000	0.000	1.000
"	1 or 2	7	25	1	0.000	0.000	1.000
"	1 or 2	8	25	1	0.000	0.000	1.000
"	1 or 2	9	25	1	0.000	0.000	1.000
"	1 or 2	10	25	1	0.000	0.000	1.000
"	1 or 2	11	25	1	0.000	0.000	1.000
"	1 or 2	12	25	1	0.000	0.000	1.000
Thru WB	3 or 4	1	25	1	0.000	0.000	1.000
"	3 or 4	2	25	1	0.000	0.000	1.000
"	3 or 4	3	25	1	0.000	0.000	1.000
"	3 or 4	4	25	1	0.000	0.000	1.000
"	3 or 4	5	25	1	0.000	0.000	1.000
"	3 or 4	6	25	1	0.000	0.000	1.000
"	3 or 4	7	25	1	0.000	0.000	1.000
"	3 or 4	8	25	1	0.000	0.000	1.000
"	3 or 4	9	25	1	0.000	0.000	1.000
"	3 or 4	10	25	1	0.000	0.000	1.000
"	3 or 4	11	25	1	0.000	0.000	1.000
"	3 or 4	12	25	1	0.000	0.000	1.000
Intermodal Train EB Arrivals	5	28	10	2	0.000	0.000	1.000
"	5	27	10	2	0.000	0.000	1.000
"	5	26	10	2	0.000	0.000	0.333
"	5	25	10	2	0.000	0.000	0.333
"	5	24	10	2	0.000	0.000	0.333
"	5	23	10	2	0.000	0.000	0.333
"	5	22	10	2	0.500	0.167	0.000
"	5	-22	10	2	0.000	0.000	0.333
"	5	-21	10	2	0.000	0.000	0.333
"	5	33	10	2	0.000	0.000	0.333
"	5	32	10	2	0.000	0.000	0.333
"	5	31	10	2	0.000	0.000	0.333
"	5	30	10	2	0.500	0.167	0.000
"	5	-30	10	2	0.000	0.000	0.333
"	5	-29	10	2	0.000	0.000	0.333
"	5	39	10	2	0.000	0.000	0.333
"	5	38	10	2	0.000	0.000	0.333
"	5	37	10	2	0.000	0.000	0.333
"	5	36	10	2	0.000	0.000	0.333
"	5	35	10	2	0.500	0.167	0.000
"	5	-35	10	2	0.000	0.000	0.333
"	5	-34	10	2	0.000	0.000	0.333
"	5	-40	10	2	0.000	0.000	1.000
Intermodal Train WB Arrivals	6	1	10	2	0.000	0.000	1.000
"	6	2	10	2	0.000	0.000	1.000
"	6	3	10	2	0.000	0.000	1.000
"	6	4	10	2	0.000	0.000	1.000
"	6	58	10	2	0.000	0.000	1.000
"	6	21	10	2	0.000	0.000	0.333
"	6	22	10	2	0.000	0.000	0.333
"	6	23	10	2	0.000	0.000	0.333
"	6	24	10	2	0.500	0.167	0.000
"	6	-24	10	2	0.000	0.000	0.333
"	6	-25	10	2	0.000	0.000	0.333
"	6	-26	10	2	0.000	0.000	0.333
"	6	-26	10	2	0.000	0.000	1.000
"	6	-25	10	2	0.000	0.000	1.000
"	6	-24	10	2	0.000	0.000	1.000
"	6	-23	10	2	0.000	0.000	1.000
"	6	-22	10	2	0.000	0.000	1.000
"	6	-21	10	2	0.000	0.000	1.000
"	6	-40	10	2	0.000	0.000	1.000
"	6	29	10	2	0.000	0.000	0.333
"	6	30	10	2	0.000	0.000	0.333
"	6	31	10	2	0.000	0.000	0.333
"	6	32	10	2	0.500	0.167	0.000
"	6	-32	10	2	0.000	0.000	0.333
"	6	-33	10	2	0.000	0.000	0.333
"	6	34	10	2	0.000	0.000	0.333
"	6	35	10	2	0.000	0.000	0.333
"	6	36	10	2	0.000	0.000	0.333
"	6	37	10	2	0.000	0.000	0.333
"	6	38	10	2	0.500	0.167	0.000
"	6	-38	10	2	0.000	0.000	0.333

"	6	-39	10	2	0.000	0.000	0.333
Intermodal Train EB Departures	7	22	10	2	0.250	0.083	0.167
"	7	21	10	2	0.000	0.000	0.167
"	7	58	10	2	0.000	0.000	0.500
"	7	4	10	2	0.000	0.000	0.500
"	7	3	10	2	0.000	0.000	0.500
"	7	2	10	2	0.000	0.000	0.500
"	7	1	10	2	0.000	0.000	0.500
"	7	30	10	2	0.250	0.083	0.167
"	7	29	10	2	0.000	0.000	0.167
"	7	35	10	2	0.250	0.083	0.167
"	7	34	10	2	0.000	0.000	0.167
"	7	14	10	2	0.750	0.250	0.500
"	7	13	10	2	0.000	0.000	0.500
Intermodal Train WB Departures	8	24	10	2	0.250	0.083	0.167
"	8	25	10	2	0.000	0.000	0.167
"	8	26	10	2	0.000	0.000	0.167
"	8	27	10	2	0.000	0.000	0.500
"	8	28	10	2	0.000	0.000	1.000
"	8	32	10	2	0.250	0.083	0.167
"	8	33	10	2	0.000	0.000	0.167
"	8	38	10	2	0.250	0.083	0.167
"	8	39	10	2	0.000	0.000	0.167
"	8	19	10	2	0.750	0.250	0.500
"	8	20	10	2	0.000	0.000	0.500
"	8	42	10	2	0.000	0.000	0.500
"	8	43	10	2	0.000	0.000	0.500
"	8	44	10	2	0.000	0.000	0.500
"	8	45	10	2	0.000	0.000	0.500
"	8	46	10	2	0.000	0.000	0.500
"	8	47	10	2	0.000	0.000	0.500
"	8	48	10	2	0.000	0.000	0.500
"	8	49	10	2	0.000	0.000	0.500
Intermodal EB Arriving and Departing Arrivals	9	28	10	2	0.000	0.000	1.000
"	9	27	10	2	0.000	0.000	1.000
"	9	26	10	2	0.000	0.000	0.333
"	9	25	10	2	0.000	0.000	0.333
"	9	24	10	2	0.000	0.000	0.333
"	9	23	10	2	0.000	0.000	0.333
"	9	22	10	2	0.167	0.167	0.000
"	9	33	10	2	0.000	0.000	0.333
"	9	32	10	2	0.000	0.000	0.333
"	9	31	10	2	0.000	0.000	0.333
"	9	30	10	2	0.167	0.167	0.000
"	9	39	10	2	0.000	0.000	0.333
"	9	38	10	2	0.000	0.000	0.333
"	9	37	10	2	0.000	0.000	0.333
"	9	36	10	2	0.000	0.000	0.333
"	9	35	10	2	0.167	0.167	0.000
Intermodal EB Arriving and Departing Departures	10	22	10	2	0.000	0.000	0.333
"	10	21	10	2	0.000	0.000	0.333
"	10	58	10	2	0.000	0.000	1.000
"	10	4	10	2	0.000	0.000	1.000
"	10	3	10	2	0.000	0.000	1.000
"	10	2	10	2	0.000	0.000	1.000
"	10	1	10	2	0.000	0.000	1.000
"	10	30	10	2	0.000	0.000	0.333
"	10	29	10	2	0.000	0.000	0.333
"	10	35	10	2	0.000	0.000	0.333
"	10	34	10	2	0.000	0.000	0.333
Intermodal WB Arriving and Departing Arrivals	11	1	10	2	0.000	0.000	1.000
"	11	2	10	2	0.000	0.000	1.000
"	11	3	10	2	0.000	0.000	1.000
"	11	4	10	2	0.000	0.000	1.000
"	11	58	10	2	0.000	0.000	1.000
"	11	21	10	2	0.000	0.000	0.333
"	11	22	10	2	0.000	0.000	0.333
"	11	23	10	2	0.000	0.000	0.333
"	11	24	10	2	0.167	0.167	0.000
"	11	29	10	2	0.000	0.000	0.333
"	11	30	10	2	0.000	0.000	0.333
"	11	31	10	2	0.000	0.000	0.333
"	11	32	10	2	0.167	0.167	0.000
"	11	34	10	2	0.000	0.000	0.333
"	11	35	10	2	0.000	0.000	0.333
"	11	36	10	2	0.000	0.000	0.333
"	11	37	10	2	0.000	0.000	0.333
"	11	38	10	2	0.167	0.167	0.000
Intermodal WB Arriving and Departing Departures	12	24	10	2	0.000	0.000	0.333
"	12	25	10	2	0.000	0.000	0.333
"	12	26	10	2	0.000	0.000	0.333
"	12	27	10	2	0.000	0.000	1.000

"	12	28	10	2	0.000	0.000	1.000
"	12	32	10	2	0.000	0.000	0.333
"	12	33	10	2	0.000	0.000	0.333
"	12	38	10	2	0.000	0.000	0.333
"	12	39	10	2	0.000	0.000	0.333
Other Train EB Arrivals	13	28	10	2	0.000	0.000	1.000
"	13	49	10	2	0.000	0.000	1.000
"	13	48	10	2	0.000	0.000	1.000
"	13	47	10	2	0.000	0.000	1.000
"	13	46	10	2	0.000	0.000	1.000
"	13	45	10	2	0.750	0.250	0.000
"	13	-45	10	2	0.000	0.000	0.500
"	13	-44	10	2	0.000	0.000	0.500
"	13	-43	10	2	0.000	0.000	0.500
"	13	-42	10	2	0.000	0.000	0.500
"	13	-40	10	2	0.000	0.000	0.500
"	13	45	10	2	0.000	0.000	0.500
"	13	44	10	2	0.000	0.000	0.500
"	13	43	10	2	0.000	0.000	0.500
"	13	42	10	2	0.000	0.000	0.500
"	13	20	10	2	0.000	0.000	0.500
"	13	19	10	2	0.000	0.000	0.500
"	13	18	10	2	0.000	0.000	0.500
"	13	17	10	2	0.000	0.000	0.500
"	13	16	10	2	0.000	0.000	0.500
"	13	15	10	2	0.000	0.000	0.500
"	13	14	10	2	0.750	0.250	0.000
"	13	-14	10	2	0.000	0.000	0.500
"	13	-14	10	2	0.000	0.000	0.500
"	13	-15	10	2	0.000	0.000	0.500
"	13	-16	10	2	0.000	0.000	0.500
"	13	-17	10	2	0.000	0.000	0.500
"	13	-18	10	2	0.000	0.000	0.500
"	13	-19	10	2	0.000	0.000	0.500
"	13	-20	10	2	0.000	0.000	0.500
"	13	-40	10	2	0.000	0.000	0.500
Other Train WB Arrivals	14	13	10	2	0.000	0.000	0.500
"	14	14	10	2	0.000	0.000	0.500
"	14	15	10	2	0.000	0.000	0.500
"	14	16	10	2	0.000	0.000	0.500
"	14	17	10	2	0.000	0.000	0.500
"	14	18	10	2	0.000	0.000	0.500
"	14	19	10	2	0.750	0.250	0.000
"	14	-19	10	2	0.000	0.000	0.500
"	14	-20	10	2	0.000	0.000	0.500
"	14	-40	10	2	0.000	0.000	1.000
"	14	1	10	2	0.000	0.000	0.500
"	14	2	10	2	0.000	0.000	0.500
"	14	3	10	2	0.000	0.000	0.500
"	14	4	10	2	0.000	0.000	0.500
"	14	58	10	2	0.000	0.000	0.500
"	14	42	10	2	0.000	0.000	0.500
"	14	43	10	2	0.000	0.000	0.500
"	14	44	10	2	0.000	0.000	0.500
"	14	45	10	2	0.000	0.000	0.500
"	14	46	10	2	0.000	0.000	0.500
"	14	47	10	2	0.750	0.250	0.000
"	14	-47	10	2	0.000	0.000	0.500
"	14	-48	10	2	0.000	0.000	0.500
"	14	-48	10	2	0.000	0.000	0.500
"	14	-47	10	2	0.000	0.000	0.500
"	14	-46	10	2	0.000	0.000	0.500
"	14	-45	10	2	0.000	0.000	0.500
"	14	-44	10	2	0.000	0.000	0.500
"	14	-43	10	2	0.000	0.000	0.500
"	14	-42	10	2	0.000	0.000	0.500
Other Train EB Departures	15	14	10	2	0.750	0.250	0.500
"	15	13	10	2	0.000	0.000	0.500
"	15	45	10	2	0.750	0.250	0.500
"	15	44	10	2	0.000	0.000	0.500
"	15	43	10	2	0.000	0.000	0.500
"	15	42	10	2	0.000	0.000	0.500
"	15	58	10	2	0.000	0.000	0.500
"	15	4	10	2	0.000	0.000	0.500
"	15	3	10	2	0.000	0.000	0.500
"	15	2	10	2	0.000	0.000	0.500
"	15	1	10	2	0.000	0.000	0.500
Other Train WB Departures	16	19	10	2	0.750	0.250	0.500
"	16	20	10	2	0.000	0.000	0.500
"	16	42	10	2	0.000	0.000	0.500
"	16	43	10	2	0.000	0.000	0.500
"	16	44	10	2	0.000	0.000	0.500

"	16	45	10	2	0.000	0.000	0.500
"	16	46	10	2	0.000	0.000	0.500
"	16	47	10	2	0.000	0.000	0.500
"	16	48	10	2	0.000	0.000	0.500
"	16	49	10	2	0.000	0.000	0.500
"	16	28	10	2	0.000	0.000	1.000
"	16	47	10	2	0.750	0.250	0.500
"	16	48	10	2	0.000	0.000	0.500
"	16	49	10	2	0.000	0.000	0.500
Other EB Arriving and Departing Arrivals	17	28	10	2	0.000	0.000	1.000
"	17	49	10	2	0.000	0.000	1.000
"	17	48	10	2	0.000	0.000	1.000
"	17	47	10	2	0.000	0.000	1.000
"	17	46	10	2	0.000	0.000	1.000
"	17	45	10	2	0.500	0.500	0.000
Other EB Arriving and Departing Departures	18	45	10	2	0.000	0.000	1.000
"	18	44	10	2	0.000	0.000	1.000
"	18	43	10	2	0.000	0.000	1.000
"	18	42	10	2	0.000	0.000	1.000
"	18	58	10	2	0.000	0.000	1.000
"	18	4	10	2	0.000	0.000	1.000
"	18	3	10	2	0.000	0.000	1.000
"	18	2	10	2	0.000	0.000	1.000
"	18	1	10	2	0.000	0.000	1.000
Other WB Arriving and Departing Arrivals	19	1	10	2	0.000	0.000	1.000
"	19	2	10	2	0.000	0.000	1.000
"	19	3	10	2	0.000	0.000	1.000
"	19	4	10	2	0.000	0.000	1.000
"	19	58	10	2	0.000	0.000	1.000
"	19	42	10	2	0.000	0.000	1.000
"	19	43	10	2	0.000	0.000	1.000
"	19	44	10	2	0.000	0.000	1.000
"	19	45	10	2	0.000	0.000	1.000
"	19	46	10	2	0.000	0.000	1.000
"	19	47	10	2	0.500	0.500	0.000
Other WB Arriving and Departing Departures	20	47	10	2	0.000	0.000	1.000
"	20	48	10	2	0.000	0.000	1.000
"	20	49	10	2	0.000	0.000	1.000
"	20	28	10	2	0.000	0.000	1.000
Power Moves Thru EB	21 or 22	12	25	1	0.000	0.000	1.000
"	21 or 22	11	25	1	0.000	0.000	1.000
"	21 or 22	10	25	1	0.000	0.000	1.000
"	21 or 22	9	25	1	0.000	0.000	1.000
"	21 or 22	8	25	1	0.000	0.000	1.000
"	21 or 22	7	25	1	0.000	0.000	1.000
"	21 or 22	6	25	1	0.000	0.000	1.000
"	21 or 22	5	25	1	0.000	0.000	1.000
"	21 or 22	4	25	1	0.000	0.000	1.000
"	21 or 22	3	25	1	0.000	0.000	1.000
"	21 or 22	2	25	1	0.000	0.000	1.000
"	21 or 22	1	25	1	0.000	0.000	1.000
Power Moves Thru WB Arriving	23 or 24	1	25	1	0.000	0.000	1.000
"	23 or 24	2	25	1	0.000	0.000	1.000
"	23 or 24	3	25	1	0.000	0.000	1.000
"	23 or 24	4	25	1	0.000	0.000	1.000
"	23 or 24	5	25	1	0.000	0.000	1.000
"	23 or 24	6	25	1	0.000	0.000	1.000
"	23 or 24	7	25	1	0.000	0.000	1.000
"	23 or 24	8	25	1	0.000	0.000	1.000
"	23 or 24	9	25	1	0.000	0.000	1.000
"	23 or 24	10	25	1	0.000	0.000	1.000
"	23 or 24	11	25	1	0.000	0.000	1.000
"	23 or 24	12	25	1	0.000	0.000	1.000
Power Moves EB Arrivals	25	28	10	2	0.000	0.000	1.000
"	25	49	10	2	0.000	0.000	1.000
"	25	48	10	2	0.000	0.000	1.000
"	25	47	10	2	0.000	0.000	1.000
"	25	46	10	2	0.000	0.000	1.000
"	25	45	10	2	0.000	0.000	1.000
"	25	44	10	2	0.000	0.000	1.000
"	25	43	10	2	0.000	0.000	1.000
"	25	42	10	2	0.000	0.000	1.000
"	25	40	10	2	0.000	0.000	1.000
Power Moves EB Departures	26	1	10	2	0.000	0.000	1.000
"	26	2	10	2	0.000	0.000	1.000
"	26	3	10	2	0.000	0.000	1.000
"	26	4	10	2	0.000	0.000	1.000
"	26	58	10	2	0.000	0.000	1.000
"	26	40	10	2	0.000	0.000	1.000
Power Moves WB Arrivals	27	40	10	2	0.000	0.000	1.000
"	27	58	10	2	0.000	0.000	1.000
"	27	4	10	2	0.000	0.000	1.000

"	27	3	10	2	0.000	0.000	1.000
"	27	2	10	2	0.000	0.000	1.000
"	27	1	10	2	0.000	0.000	1.000
Power Moves WB Departures	28	40	10	2	0.000	0.000	1.000
"	28	42	10	2	0.000	0.000	1.000
"	28	43	10	2	0.000	0.000	1.000
"	28	44	10	2	0.000	0.000	1.000
"	28	45	10	2	0.000	0.000	1.000
"	28	46	10	2	0.000	0.000	1.000
"	28	47	10	2	0.000	0.000	1.000
"	28	48	10	2	0.000	0.000	1.000
"	28	49	10	2	0.000	0.000	1.000
"	28	28	10	2	0.000	0.000	1.000

#### Notes

- (1) Segment numbers listed as negative values are in-yard power moves from arriving trains to service or from service to departing trains
- (2) Non-ZTR Idling is the duration of an idle event when units without ZTR continue to idle after ZTR-equipped units have shut down
- (3) Idling All is the duration of idling during which all locomotives continue to idle
- (4) Fraction of Segment Moving is the fraction of the length of the segment over which the movement occurs  
(On departure, power moves from service are assumed to connect to trains 20% of the way into a track segment)
- (5) All intermodal arriving trains, including those arriving and departing, are assumed to be distributed evenly between the three parts of the intermodal yard (west, center, and east)
- (6) 50% of departing intermodal trains are assumed to depart from the Desert Yard, and the other 50% from the three parts of the intermodal yard
- (7) 50% of other trains arriving or departing are assumed to use the Desert Yard, and the other 50% use the manifest yard (both arrivals and departures)
- (8) All other trains both arriving and departing are assumed to use the manifest yard

Yard Operations	Activity Code	Segment Number	Duty Cycle	Non-ZTR	Working	
			Number	Idle Time (hrs)	ZTR Idle Time (hrs)	Time (hrs)
Desert Yard	29	13	3	0	0	0.308032
"	29	14	3	0	0	3.969727
"	29	15	3	0	0	0.1179
"	29	16	3	0	0	7.689406
"	29	17	3	0	0	1.864698
"	29	18	3	0	0	2.708776
"	29	19	3	0	0	4.087627
"	29	20	3	0	0	3.253836
Main Yard	30	21	3	0	0	0.685084
"	30	22	3	0	0	0.465883
"	30	23	3	0	0	1.397648
"	30	24	3	0	0	0.465883
"	30	25	3	0	0	0.281196
"	30	26	3	0	0	0.988835
"	30	27	3	0	0	2.085741
"	30	28	3	0	0	0.781185
"	30	29	3	0	0	0.570299
"	30	30	3	0	0	0.536808
"	30	31	3	0	0	1.610423
"	30	32	3	0	0	0.536808
"	30	33	3	0	0	0.910498
"	30	34	3	0	0	0.531774
"	30	35	3	0	0	0.534255
"	30	36	3	0	0	0.423648
"	30	37	3	0	0	1.179116
"	30	38	3	0	0	0.534255
"	30	39	3	0	0	0.731867
"	30	40	3	0	0	0.528516
"	30	41	3	0	0	0.46395
"	30	42	3	0	0	0.502819
"	30	43	3	0	0	1.345005
"	30	44	3	0	0	0.360698
"	30	45	3	0	0	0.479812
"	30	46	3	0	0	1.439435
"	30	47	3	0	0	0.479812
"	30	48	3	0	0	0.42112
"	30	49	3	0	0	0.177878
"	30	50	3	0	0	0.467931
"	30	51	3	0	0	0.541144
"	30	52	3	0	0	0.474237
"	30	53	3	0	0	0.200614
"	30	54	3	0	0	0.204891
"	30	55	3	0	0	0.200889
"	30	56	3	0	0	0.31515
"	30	57	3	0	0	0.144901

**Duty Cycles (Percent of Time by Notch)**  
Through Trains and Power Moves  
In Yard Movement  
Yard Switchers

Duty Cycle Number	Idle	DB	N1	N2	N3	N4	N5	N6	N7	N8
1	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	0.0%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3	59.8%	0.0%	12.4%	12.3%	5.8%	3.6%	3.6%	1.5%	0.2%	0.8%

### Emission Factors Weighted by Model/Tier/ZTR Fractions - DPM g/hr per Locomotive

Locomotive Model Group	Group ID	Idle-Factors											
		Idle-NonZTR	Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8	
<b>California Fuel</b>													
Service	1	12.38	25.68	46.28	43.27	100.75	220.61	275.82	365.56	557	646.79	712.05	
LoadTest	2	27.99	32.09	51.91	34.83	98.76	185.87	214.34	268.34	420.68	499.96	597.98	
<b>47-State Fuel</b>													
Service	1	12.38	25.68	46.28	43.27	100.75	222.80	279.57	371.25	565.14	655.93	722.35	
LoadTest	2	27.99	32.09	51.91	34.83	98.76	187.21	217.31	272.90	426.47	504.90	604.00	

Note: Idle-NonZTR is the average per-locomotive idle emission rate for the fraction of locomotives not equipped with ZTR/Auto start-stop technology

### Service and Shop Activity

Activity	Number of Locomotives in 2005*	Fraction of Calif. Fuel	Duration of Activity per Locomotive (minutes)										
			Idle-Factors										
			Idle-NonZTR	Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8
Service - Inbound & Service	4653	0.00	90	30	0	0	0	0	0	0	0	0	0
Service - Post Service	4653	0.90	90	30	0	0	0	0	0	0	0	0	0
Pre-Maintenance Load Test	5	0.90	0	2	0	0	0	0	0	0	0	0	8
Post-Maintenance Load Test	5	0.90	0	2	0	0	0	0	0	0	0	0	8
Quarterly Maintenance Load Test	10	0.90	0	2	0	0	0	0	0	0	0	0	8
Unscheduled Mtc Post Test	4	0.90	0	1	0	0	0	0	0	0	0	0	5

\* Emissions calculated for same number of events as 2007. Emissions then scaled to reflect change in number of terminating locomotives in the yard.

### Locomotive Model Distributions

#### Locomotives Serviced

Technology	ZTR/AESS	Switcher	GP-3x	GP-4x	SD-50	GP-60	SD-7x	SD-90	Dash 7	Dash 8	Dash 9	C-60
Pre Tier 0	No	0.0000	0.0000	0.0547	0.0001	0.0039	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pre Tier 0	Yes	0.0035	0.0119	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 0	No	0.0000	0.0000	0.0242	0.0000	0.0183	0.2157	0.0025	0.0000	0.0195	0.1168	0.0000
Tier 0	Yes	0.0040	0.0138	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 1	Yes	0.0003	0.0010	0.0000	0.0000	0.0000	0.2122	0.0000	0.0000	0.0000	0.0391	0.0000
Tier 2	No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tier 2	Yes	0.0001	0.0003	0.0000	0.0000	0.0000	0.1910	0.0000	0.0000	0.0000	0.0669	0.0000

**Locomotives Load Tested**

<b>Technology</b>	<b>ZTR/AESS</b>	<b>Switcher</b>	<b>GP-3x</b>	<b>GP-4x</b>	<b>SD-50</b>	<b>GP-60</b>	<b>SD-7x</b>	<b>SD-90</b>	<b>Dash 7</b>	<b>Dash 8</b>	<b>Dash 9</b>	<b>C-60</b>
<b>Pre Tier 0</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Pre Tier 0</b>	<b>Yes</b>	0.0000	0.2254	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 0</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.1706	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 0</b>	<b>Yes</b>	0.0000	0.2611	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 1</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 1</b>	<b>Yes</b>	0.0000	0.0182	0.0000	0.0000	0.0000	0.1678	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 2</b>	<b>No</b>	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<b>Tier 2</b>	<b>Yes</b>	0.0000	0.0059	0.0000	0.0000	0.0000	0.1510	0.0000	0.0000	0.0000	0.0000	0.0000

**Example 1 -- WB Arriving Intermodal Trains**

Parameter	Value
Activity Code	6
Number of Events	1101
Locomotives per Consist on Train	2.553
Locomotives per Consist Working During Power Moves	1.5
Emission Factor Group	2
Fraction of California Fuel	0.00

Route Followed	Segment Number	Length (miles)	Speed (mph)	Power Move	Non-ZTR Idle (hrs)	ZTR Idle (hrs)	Fraction of Segment	Locomotive Hours Moving	Locomotive Hours NonZTR	Locomotive Hours Idle	Locomotive Hours ZTR
							Moving	Moving	Idle	ZTR	
Main Line 1	1	0.149	10	N	0.000	0.000	1.000	41.74	0.00	0.00	0.00
Main Line 2	2	0.192	10	N	0.000	0.000	1.000	53.83	0.00	0.00	0.00
Main Line 3	3	0.480	10	N	0.000	0.000	1.000	134.89	0.00	0.00	0.00
From Main Line to North End of Main Yard	4	0.221	10	N	0.000	0.000	1.000	62.18	0.00	0.00	0.00
Main Line Split to Yard North End Split	58	0.382	10	N	0.000	0.000	1.000	107.43	0.00	0.00	0.00
IM Yard North End Split to West IM Yard	21	0.170	10	N	0.000	0.000	0.333	15.91	0.00	0.00	0.00
North End of West IM Yard	22	0.116	10	N	0.000	0.000	0.333	10.82	0.00	0.00	0.00
Center of West IM Yard	23	0.346	10	N	0.000	0.000	0.333	32.46	0.00	0.00	0.00
South End of West IM Yard	24	0.116	10	N	0.500	0.167	0.000	0.00	1405.43	468.48	0.00
South End of West IM Yard	24	0.116	10	Y	0.000	0.000	0.333	6.36	0.00	0.00	0.00
IM Yard South End Split to West IM Yard #2	25	0.070	10	Y	0.000	0.000	0.333	3.84	0.00	0.00	0.00
IM Yard South End Split to West IM Yard #1	26	0.245	10	Y	0.000	0.000	0.333	13.49	0.00	0.00	0.00
IM Yard South End Split to West IM Yard #1	26	0.245	10	Y	0.000	0.000	1.000	40.46	0.00	0.00	0.00
IM Yard South End Split to West IM Yard #2	25	0.070	10	Y	0.000	0.000	1.000	11.51	0.00	0.00	0.00
South End of West IM Yard	24	0.116	10	Y	0.000	0.000	1.000	19.07	0.00	0.00	0.00
Center of West IM Yard	23	0.346	10	Y	0.000	0.000	1.000	57.21	0.00	0.00	0.00
North End of West IM Yard	22	0.116	10	Y	0.000	0.000	1.000	19.07	0.00	0.00	0.00
IM Yard North End Split to West IM Yard	21	0.170	10	Y	0.000	0.000	1.000	28.04	0.00	0.00	0.00
IM Yard North End Split to Service	40	0.131	10	Y	0.000	0.000	1.000	21.63	0.00	0.00	0.00
IM Yard North End Split to Center IM Yard	29	0.141	10	N	0.000	0.000	0.333	13.24	0.00	0.00	0.00
North End of Center IM Yard	30	0.133	10	N	0.000	0.000	0.333	12.46	0.00	0.00	0.00
Center of Center IM Yard	31	0.399	10	N	0.000	0.000	0.333	37.39	0.00	0.00	0.00
South End of Center IM Yard	32	0.133	10	N	0.500	0.167	0.000	0.00	1405.43	468.48	0.00
South End of Center IM Yard	32	0.133	10	Y	0.000	0.000	0.333	7.32	0.00	0.00	0.00
IM Yard South End Split to Center IM Yard	33	0.226	10	Y	0.000	0.000	0.333	12.42	0.00	0.00	0.00
IM Yard North End Split to East IM Yard	34	0.132	10	N	0.000	0.000	0.333	12.35	0.00	0.00	0.00
North End of East IM Yard	35	0.132	10	N	0.000	0.000	0.333	12.41	0.00	0.00	0.00
Center of East IM Yard #1	36	0.105	10	N	0.000	0.000	0.333	9.84	0.00	0.00	0.00
Center of East IM Yard #2	37	0.292	10	N	0.000	0.000	0.333	27.38	0.00	0.00	0.00
South End of East IM Yard	38	0.132	10	N	0.500	0.167	0.000	0.00	1405.43	468.48	0.00
South End of East IM Yard	38	0.132	10	Y	0.000	0.000	0.333	7.29	0.00	0.00	0.00
IM Yard South End Split to East IM Yard	39	0.181	10	Y	0.000	0.000	0.333	9.99	0.00	0.00	0.00

Note: Each of the three IM Yards are assumed to handle one third of the arriving IM trains.

Total	842.03	4216.28	1405.43
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		Idle- NonZTR											
		Group ID	Idle- NonZTR	Idle-All	DB	N1	N2	N3	N4	N5	N6	N7	N8
Arriving IM Trains - CA Fuel	2	10.17	23.81	42.33	43.56	97.79	223.16	282.61	374.06	574.6	666.85	722.75	
Arriving IM Trains - 47-State Fuel	2	10.17	23.81	42.33	43.56	97.79	225.38	286.45	379.88	582.99	676.22	733.19	
CA Fuel Fraction Adjusted Rates		10.17	23.81	42.33	43.56	97.79	225.38	286.45	379.88	582.99	676.22	733.19	
<b>Duty Cycle Moving</b>	2	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	
<b>Weighted g/hr emissions</b>		0.00	0.00	0.00	21.78	48.90	0.00	0.00	0.00	0.00	0.00	0.00	
		Idle- NonZTR											
<b>Emission Rate (g/hr)</b>		Moving	NonZTR	Idle-All									
Locomotive Hours		70.68	10.17	23.81									
		842.03	4216.28	1405.43									
<b>Total Emissions (g/vr)</b>		<b>59510</b>	<b>42880</b>	<b>33463</b>									

## Example 2 -- Quarterly Maintenance Load Testing

## DRAYAGE TRUCKS

Summary of Emissions from Intermodal HHD Diesel-Fueled Truck Traffic  
 Oakland Rail Yard, Oakland, California

**Running Exhaust Emissions**

Number of Truck Trips <sup>1</sup>	VMT per Trip <sup>2</sup>	Annual VMT (mi/yr)	2005 Emission Factors					2005 Emission Estimates				
			(g/mi) <sup>3,4</sup>					(tons/yr)				
			ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
349,585	1.5	524,377.50	5.28	14.23	27.80	2.19	0.03	3.05	8.23	16.07	1.26	0.02

**Idling Exhaust Emissions**

Number of Truck Trips	Idling <sup>2</sup>		2005 Emission Factors					2005 Emissions Estimates (tons/yr)				
			(g/hr) <sup>5</sup>					(tons/yr)				
	(mins/trip)	(hr/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
349,585	30	174,792.50	16.36	55.88	99.67	2.93	0.58	3.15	10.77	19.20	0.57	0.11

Notes:

1. Number of truck trips calculated from UPRR provided gate counts. The total gate counts were increased by 25% to account for bobtail trucks (trucks without a chassis or trailer and trucks with an empty chassis).
2. VMT per trip and idling time (mins/trip) is an engineering estimate from personal observation.
3. Running exhaust emission factors calculated from EMFAC2007 model with the BURDEN output option.
4. Running exhaust emission factor calculations assumed an average speed of 15 mph.
5. Idling exhaust emission factors calculated from EMFAC2007 model with the EMFAC output option.

Summary of Emissions from Intermodal HHD Diesel-Fueled Truck Traffic  
 Oakland Rail Yard, Oakland, California

**Running Exhaust Emissions**

Number of Truck Trips <sup>1</sup>	VMT per Trip <sup>2</sup>	Annual VMT (mi/yr)	2007 Emission Factors					2007 Emission Estimates				
			(g/mi) <sup>3,4</sup>					(tons/yr)				
			ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
294,328	1.5	441,491.25	49.74	13.08	2.63	1.86	0.03	24.21	6.37	1.28	0.91	0.01

**Idling Exhaust Emissions**

Number of Truck Trips	Idling <sup>2</sup>		2007 Emission Factors					2007 Emissions Estimates (tons/yr)				
			(g/hr) <sup>5</sup>					(tons/yr)				
	(mins/trip)	(hr/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
294,328	30	147,163.75	14.81	53.87	103.71	2.45	0.06	2.40	8.74	16.82	0.40	0.01

Notes:

1. Number of truck trips calculated from UPRR provided gate counts. The total gate counts were increased by 25% to account for bobtail trucks (trucks without a chassis or trailer and trucks with an empty chassis). Assumed 1% growth per year from 2007.
2. VMT per trip and idling time (mins/trip) is an engineering estimate from personal observation.
3. Running exhaust emission factors calculated from EMFAC2007 model with the BURDEN output option.
4. Running exhaust emission factor calculations assumed an average speed of 15 mph.
5. Idling exhaust emission factors calculated from EMFAC2007 model with the EMFAC output option.

Summary of Emissions from Intermodal HHD Diesel-Fueled Truck Traffic  
 Oakland Rail Yard, Oakland, California

**Running Exhaust Emissions**

Number of Truck Trips <sup>1</sup>	VMT per Trip <sup>2</sup>	Annual VMT (mi/yr)	2010 Emission Factors					2010 Emission Estimates				
			(g/mi) <sup>3,4</sup>					(tons/yr)				
			ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
303,246	1.5	454,868.88	4.16	10.61	21.92	1.40	0.03	2.08	5.32	10.99	0.70	0.01

**Idling Exhaust Emissions**

Number of Truck Trips	Idling <sup>2</sup>		2010 Emission Factors					2010 Emissions Estimates (tons/yr)				
			(g/hr) <sup>5</sup>					(tons/yr)				
	(mins/trip)	(hr/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
303,246	30	151,622.96	12.74	51.08	109.21	1.88	0.06	2.13	8.54	18.25	0.31	0.01

Notes:

1. Number of truck trips calculated from UPRR provided gate counts. The total gate counts were increased by 25% to account for bobtail trucks (trucks without a chassis or trailer and trucks with an empty chassis). Assumed 1% growth per year from 2007.
2. VMT per trip and idling time (mins/trip) is an engineering estimate from personal observation.
3. Running exhaust emission factors calculated from EMFAC2007 model with the BURDEN output option.
4. Running exhaust emission factor calculations assumed an average speed of 15 mph.
5. Idling exhaust emission factors calculated from EMFAC2007 model with the EMFAC output option.

Summary of Emissions from Intermodal HHD Diesel-Fueled Truck Traffic  
 Oakland Rail Yard, Oakland, California

**Running Exhaust Emissions**

Number of Truck Trips <sup>1</sup>	VMT per Trip <sup>2</sup>	Annual VMT (mi/yr)	2015 Emission Factors					2015 Emission Estimates				
			(g/mi) <sup>3,4</sup>					(tons/yr)				
			ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
318,715	1.5	478,071.76	2.61	6.41	13.21	0.71	0.03	1.37	3.38	6.96	0.38	0.01

**Idling Exhaust Emissions**

Number of Truck Trips	Idling <sup>2</sup>		2015 Emission Factors					2015 Emission Estimates				
			(g/hr) <sup>5</sup>					(tons/yr)				
	(mins/trip)	(hr/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
318,715	30	159,357.25	10.24	47.49	115.95	1.12	0.06	1.80	8.34	20.37	0.20	0.01

Notes:

1. Number of truck trips calculated from UPRR provided gate counts. The total gate counts were increased by 25% to account for bobtail trucks (trucks without a chassis or trailer and trucks with an empty chassis). Assumed 1% growth per year from 2007.
2. VMT per trip and idling time (mins/trip) is an engineering estimate from personal observation.
3. Running exhaust emission factors calculated from EMFAC2007 model with the BURDEN output option.
4. Running exhaust emission factor calculations assumed an average speed of 15 mph.
5. Idling exhaust emission factors calculated from EMFAC2007 model with the EMFAC output option.

Summary of Emissions from Intermodal HHD Diesel-Fueled Truck Traffic  
 Oakland Rail Yard, Oakland, California

**Running Exhaust Emissions**

Number of Truck Trips <sup>1</sup>	VMT per Trip <sup>2</sup>	Annual VMT (mi/yr)	2020 Emission Factors					2020 Emission Estimates				
			(g/mi) <sup>3,4</sup>					(tons/yr)				
			ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
334,972	1.5	502,458.22	1.55	3.74	7.65	0.34	0.03	0.86	2.07	4.24	0.19	0.02

**Idling Exhaust Emissions**

Number of Truck Trips	Idling <sup>2</sup>		2020 Emission Factors					2020 Emission Estimates				
			(g/hr) <sup>5</sup>					(tons/yr)				
	(mins/trip)	(hr/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
334,972	30	167,486.07	8.80	45.33	119.80	0.60	0.06	1.62	8.37	22.12	0.11	0.01

Notes:

1. Number of truck trips calculated from UPRR provided gate counts. The total gate counts were increased by 25% to account for bobtail trucks (trucks without a chassis or trailer and trucks with an empty chassis). Assumed 1% growth per year from 2007.
2. VMT per trip and idling time (mins/trip) is an engineering estimate from personal observation.
3. Running exhaust emission factors calculated from EMFAC2007 model with the BURDEN output option.
4. Running exhaust emission factor calculations assumed an average speed of 15 mph.
5. Idling exhaust emission factors calculated from EMFAC2007 model with the EMFAC output option.

Summary of HHD Truck Emissions from Distribution Centers  
 Oakland Rail Yard, Oakland, California

**Truck Volumes**

Center Name	Center Location	Truck Volumes		
		(days/yr)	(trucks/day) <sup>1</sup>	(trucks/yr)
Pacific Coast Containers	2099 7th St.	365	110	40,150
Pacific Transload System	737 Bay St.	365	100	36,500
<b>Total</b>			<b>210</b>	<b>76,650</b>

**Running Exhaust Emissions**

Center Name	VMT		2005 Emission Factors					2005 Emissions Estimates				
			(g/mi) <sup>3</sup>					(tons/yr)				
	(mi/trip) <sup>2</sup>	(mi/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Pacific Coast Containers	0.20	8,030	5.28	14.23	27.80	2.19	0.03	0.05	0.13	0.25	0.02	0.00
Pacific Transload System	0.25	9,125	5.28	14.23	27.80	2.19	0.03	0.05	0.14	0.28	0.02	0.00
<b>Total</b>		<b>17,155</b>						<b>0.10</b>	<b>0.27</b>	<b>0.53</b>	<b>0.04</b>	<b>0.00</b>

**Idling Exhaust Emissions**

Center Name	Idling		2005 Emission Factors					2005 Emissions Estimates				
			(g/hr) <sup>5</sup>					(tons/yr)				
	(min/trip) <sup>4</sup>	(hr/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Pacific Coast Containers	30	20,075	16.36	55.88	99.67	2.93	0.58	0.36	1.24	2.21	0.06	0.01
Pacific Transload System	30	18,250	16.36	55.88	99.67	2.93	0.58	0.33	1.12	2.01	0.06	0.01
<b>Total</b>		<b>38,325</b>						<b>0.69</b>	<b>2.36</b>	<b>4.21</b>	<b>0.12</b>	<b>0.02</b>

Notes:

1. Estimates provided by Pacific Coast Containers, Inc.
2. Estimated from satellite photos.
3. From EMFAC2007 with the BURDEN output option.
4. Assumes 10 minutes during queuing and staging at gate, 15 minutes to drop off/pick up container, 5 minutes for any additional delays.
5. From EMFAC2007 with the EMFAC output option.

Summary of HHD Truck Emissions from Distribution Centers  
 Oakland Rail Yard, Oakland, California

**Truck Volumes**

Center Name	Center Location	Truck Volumes		
		(days/yr)	(trucks/day) <sup>1</sup>	(trucks/yr)
Pacific Coast Containers	2099 7th St.	365	93	33,938
Pacific Transload System	737 Bay St.	365	85	30,853
<b>Total</b>			<b>178</b>	<b>64,791</b>

**Running Exhaust Emissions**

Center Name	VMT		2007 Emission Factors					2007 Emissions Estimates				
			(g/mi) <sup>3</sup>					(tons/yr)				
	(mi/trip) <sup>2</sup>	(mi/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Pacific Coast Containers	0.20	6,788	49.74	13.08	2.63	1.86	0.03	0.37	0.10	0.02	0.01	0.00
Pacific Transload System	0.25	7,713	49.74	13.08	2.63	1.86	0.03	0.42	0.11	0.02	0.02	0.00
<b>Total</b>		<b>14,501</b>						<b>0.80</b>	<b>0.21</b>	<b>0.04</b>	<b>0.03</b>	<b>0.00</b>

**Idling Exhaust Emissions**

Center Name	Idling		2007 Emission Factors					2007 Emissions Estimates				
			(g/hr) <sup>5</sup>					(tons/yr)				
	(min/trip) <sup>4</sup>	(hr/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Pacific Coast Containers	30	16,969	14.81	53.87	103.71	2.45	0.06	0.28	1.01	1.94	0.05	0.00
Pacific Transload System	30	15,427	14.81	53.87	103.71	2.45	0.06	0.25	0.92	1.76	0.04	0.00
<b>Total</b>		<b>32,396</b>						<b>0.53</b>	<b>1.92</b>	<b>3.70</b>	<b>0.09</b>	<b>0.00</b>

Notes:

1. The truck count is equal to the 2005 truck count x (2007 lift count/2005 lift count).
2. Estimated from satellite photos.
3. From EMFAC2007 with the BURDEN output option.
4. Assumes 10 minutes during queuing and staging at gate, 15 minutes to drop off/pick up container, 5 minutes for any additional delays.
5. From EMFAC2007 with the EMFAC output option.

Summary of HHD Truck Emissions from Distribution Centers  
 Oakland Rail Yard, Oakland, California

**Truck Volumes**

Center Name	Center Location	Truck Volumes		
		(days/yr)	(trucks/day) <sup>1</sup>	(trucks/yr)
Pacific Coast Containers	2099 7th St.	365	96	34,967
Pacific Transload System	737 Bay St.	365	87	31,788
<b>Total</b>			<b>183</b>	<b>66,755</b>

**Running Exhaust Emissions**

Center Name	VMT		2010 Emission Factors					2010 Emissions Estimates				
			(g/mi) <sup>3</sup>					(tons/yr)				
	(mi/trip) <sup>2</sup>	(mi/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Pacific Coast Containers	0.20	6,993	4.16	10.61	21.92	1.40	0.03	0.03	0.08	0.17	0.01	0.00
Pacific Transload System	0.25	7,947	4.16	10.61	21.92	1.40	0.03	0.04	0.09	0.19	0.01	0.00
<b>Total</b>		<b>14,940</b>						<b>0.07</b>	<b>0.17</b>	<b>0.36</b>	<b>0.02</b>	<b>0.00</b>

**Idling Exhaust Emissions**

Center Name	Idling		2010 Emission Factors					2010 Emissions Estimates				
			(g/hr) <sup>5</sup>					(tons/yr)				
	(min/trip) <sup>4</sup>	(hr/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Pacific Coast Containers	30	17,483	12.74	51.08	109.21	1.88	0.06	0.25	0.98	2.10	0.04	0.00
Pacific Transload System	30	15,894	12.74	51.08	109.21	1.88	0.06	0.22	0.89	1.91	0.03	0.00
<b>Total</b>		<b>33,377</b>						<b>0.47</b>	<b>1.88</b>	<b>4.02</b>	<b>0.07</b>	<b>0.00</b>

Notes:

1. The truck count is equal to the 2005 truck count x (2010 predicted lift count/2005 lift count).
2. Estimated from satellite photos.
3. From EMFAC2007 with the BURDEN output option.
4. Assumes 10 minutes during queuing and staging at gate, 15 minutes to drop off/pick up container, 5 minutes for any additional delays.
5. From EMFAC2007 with the EMFAC output option.

Summary of HHD Truck Emissions from Distribution Centers  
 Oakland Rail Yard, Oakland, California

**Truck Volumes**

Center Name	Center Location	Truck Volumes		
		(days/yr)	(trucks/day) <sup>1</sup>	(trucks/yr)
Pacific Coast Containers	2099 7th St.	365	101	36,750
Pacific Transload System	737 Bay St.	365	92	33,409
<b>Total</b>			<b>192</b>	<b>70,160</b>

**Running Exhaust Emissions**

Center Name	VMT		2015 Emission Factors					2015 Emissions Estimates				
			(g/mi) <sup>3</sup>					(tons/yr)				
	(mi/trip) <sup>2</sup>	(mi/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Pacific Coast Containers	0.20	7,350	2.61	6.41	13.21	0.71	0.03	0.02	0.05	0.11	0.01	0.00
Pacific Transload System	0.25	8,352	2.61	6.41	13.21	0.71	0.03	0.02	0.06	0.12	0.01	0.00
<b>Total</b>		<b>15,702</b>						<b>0.05</b>	<b>0.11</b>	<b>0.23</b>	<b>0.01</b>	<b>0.00</b>

**Idling Exhaust Emissions**

Center Name	Idling		2015 Emission Factors					2015 Emissions Estimates				
			(g/hr) <sup>5</sup>					(tons/yr)				
	(min/trip) <sup>4</sup>	(hr/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Pacific Coast Containers	30	18,375	10.24	47.49	115.95	1.12	0.06	0.21	0.96	2.35	0.02	0.00
Pacific Transload System	30	16,705	10.24	47.49	115.95	1.12	0.06	0.19	0.87	2.14	0.02	0.00
<b>Total</b>		<b>35,080</b>						<b>0.40</b>	<b>1.84</b>	<b>4.48</b>	<b>0.04</b>	<b>0.00</b>

Notes:

1. The truck count is equal to the 2005 truck count x (2015 predicted lift count/2005 lift count).
2. Estimated from satellite photos.
3. From EMFAC2007 with the BURDEN output option.
4. Assumes 10 minutes during queuing and staging at gate, 15 minutes to drop off/pick up container, 5 minutes for any additional delays.
5. From EMFAC2007 with the EMFAC output option.

Summary of HHD Truck Emissions from Distribution Centers  
 Oakland Rail Yard, Oakland, California

**Truck Volumes**

Center Name	Center Location	Truck Volumes		
		(days/yr)	(trucks/day) <sup>1</sup>	(trucks/yr)
Pacific Coast Containers	2099 7th St.	365	106	38,625
Pacific Transload System	737 Bay St.	365	96	35,114
<b>Total</b>		<b>202</b>	<b>73,739</b>	

**Running Exhaust Emissions**

Center Name	VMT		2020 Emission Factors					2020 Emissions Estimates				
			(g/mi) <sup>3</sup>					(tons/yr)				
	(mi/trip) <sup>2</sup>	(mi/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Pacific Coast Containers	0.20	7,725	1.55	3.74	7.65	0.34	0.03	0.01	0.03	0.07	0.00	0.00
Pacific Transload System	0.25	8,778	1.55	3.74	7.65	0.34	0.03	0.02	0.04	0.07	0.00	0.00
<b>Total</b>		<b>16,503</b>						<b>0.03</b>	<b>0.07</b>	<b>0.14</b>	<b>0.01</b>	<b>0.00</b>

**Idling Exhaust Emissions**

Center Name	Idling		2020 Emission Factors					2020 Emissions Estimates				
			(g/hr) <sup>5</sup>					(tons/yr)				
	(min/trip) <sup>4</sup>	(hr/yr)	ROG	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Pacific Coast Containers	30	19,312	8.80	45.33	119.80	0.60	0.06	0.19	0.96	2.55	0.01	0.00
Pacific Transload System	30	17,557	8.80	45.33	119.80	0.60	0.06	0.17	0.88	2.32	0.01	0.00
<b>Total</b>		<b>36,869</b>						<b>0.36</b>	<b>1.84</b>	<b>4.87</b>	<b>0.02</b>	<b>0.00</b>

Notes:

1. The truck count is equal to the 2005 truck count x (2020 predicted lift count/2005 lift count).
2. Estimated from satellite photos.
3. From EMFAC2007 with the BURDEN output option.
4. Assumes 10 minutes during queuing and staging at gate, 15 minutes to drop off/pick up container, 5 minutes for any additional delays.
5. From EMFAC2007 with the EMFAC output option.

Title : Alameda County Subarea Annual CYr 2005 Default Title  
 Version : Emfac2007 V2.3 Nov 1 2006 \*\* WIS Enabled \*\*  
 Run Date : 2008/08/20 16:18:20  
 Scen Year: 2005-2020 -- All model years in the range 1965 to 2005 selected  
 Season : Annual  
 Area : Alameda County  
 I/M Stat : Enhanced Interim (2005)  
 Emissions: Tons Per Day

	<b>2005</b>	<b>2007</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
	HHDT-DSL	HHDT-DSL	HHDT-DSL	HHDT-DSL	HHDT-DSL
Vehicles	8337	8758	8605	8337	8657
VMT/1000	1315	1355	1329	1350	1478
Trips	42190	44321	43543	42189	43809
Reactive Organic Gas Emissions					
Run Exh	7.66	7.43	6.09	3.88	2.53
Idle Exh	0.25	0.24	0.2	0.16	0.14
Start Ex	0	0	0	0	0
	-----	-----	-----	-----	-----
Total Ex	7.92	7.67	6.29	4.04	2.68
Diurnal	0	0	0	0	0
Hot Soak	0	0	0	0	0
Running	0	0	0	0	0
Resting	0	0	0	0	0
	-----	-----	-----	-----	-----
Total	7.92	7.67	6.29	4.04	2.68
Carbon Monoxide Emissions					
Run Exh	20.63	19.54	15.54	9.54	6.09
Idle Exh	0.87	0.88	0.82	0.74	0.73
Start Ex	0	0	0	0	0
	-----	-----	-----	-----	-----
Total Ex	21.49	20.42	16.36	10.27	6.82
Oxides of Nitrogen Emissions					
Run Exh	40.3	39.25	32.11	19.66	12.47
Idle Exh	1.55	1.69	1.75	1.8	1.93
Start Ex	0	0	0	0	0
	-----	-----	-----	-----	-----
Total Ex	41.85	40.94	33.85	21.45	14.4
Carbon Dioxide Emissions (000)					
Run Exh	4.16	4.28	4.2	4.27	4.67
Idle Exh	0.1	0.11	0.1	0.1	0.11
Start Ex	0	0	0	0	0
	-----	-----	-----	-----	-----
Total Ex	4.26	4.39	4.3	4.37	4.78
PM10 Emissions					
Run Exh	3.08	2.69	1.95	0.97	0.45
Idle Exh	0.05	0.04	0.03	0.02	0.01
Start Ex	0	0	0	0	0
	-----	-----	-----	-----	-----
Total Ex	3.13	2.73	1.98	0.99	0.46
TireWear	0.05	0.05	0.05	0.05	0.06
BrakeWr	0.04	0.04	0.04	0.04	0.05
	-----	-----	-----	-----	-----
Total	3.22	2.82	2.08	1.08	0.57
Lead	0	0	0	0	0
SOx	0.38	0.04	0.04	0.04	0.05
Fuel Consumption (000 gallons)					
Gasoline	0	0	0	0	0
Diesel	383.11	395.09	387.3	393.22	429.95

Title : Alameda County Subarea Annual CYr 2005 Default Title  
Version : Emfac2007 V2.3 Nov 1 2006  
Run Date : 2008/08/20 16:28:21  
Scen Year: 2005 - 2020-- All model years in the range 1965 to 2005 selected  
Season : Annual  
Area : Alameda

Year: Emfac2007 Emission Factors: V2.3 Nov 1 2006

### County Average - Alameda

Table 1: Running Exhaust Emissions (grams/mile; grams/idle-hour)

Temperature: 57F

Relative Humidity: 75%

	Speed	2005	2007	2010	2015	2020
Speed MPH	(MPH)	HHD DSL	HHD DSL	HHD DSL	HHD DSL	HHD DSL
ROG	0	16.356	14.806	12.738	10.235	8.799
CO	0	55.879	53.873	51.077	47.489	45.327
Nox	0	99.674	103.712	109.206	115.946	119.803
CO2	0	6541.716	6541.716	6541.715	6541.715	6541.715
Sox	0	0.583	0.062	0.062	0.062	0.062
PM10	0	2.934	2.449	1.882	1.122	0.597
PM10 - Tire Wear	0	0	0	0	0	0
PM10 - Brake Wear	0	0	0	0	0	0
Pollutant Name: Gasoline - mi/gal	0	0	0	0	0	0
Pollutant Name: Diesel - mi/qal	0	0	0	0	0	0

**CARGO HANDLING EQUIPMENT AND  
HEAVY EQUIPMENT**

## Summary of Emissions from Diesel-Fueled Cargo Handling Equipment Oakland Rail Yard, Oakland, California

Equipment	Equipment		Engine Make	Engine Model	Rating (hp)	Annual Hours of Operation	Load Factor	No. of Units	2005 Emission Factors					2005 Emission (tons/yr)						
									(g/bhp-hr) <sup>4</sup>					(tons/yr)						
Type	ID/Owner	Make	Model	Year	HC	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx						
Crane	73316	Drott	2500	Case	504 BDT	1973	250	36	0.43	1	1.301	6.417	15.457	0.919	0.060	0.006	0.027	0.066	0.004	0.000
Crane	8900304	Lorain	LRT250D			1975	200	60	0.43	1	1.648	4.264	11.449	0.739	0.059	0.009	0.024	0.065	0.004	0.000
RTG	97924	Detroit	800 AC	Detroit	6-71	1979	238	0	0.43	1	NA	NA	NA	NA	NA	0.000	0.000	0.000	0.000	0.000
Backhoe	NA	Ford	555 Special			1983	55	150	0.55	1	3.632	7.812	18.728	1.717	0.061	0.018	0.039	0.094	0.009	0.000
Forklift	41410611	Hyster	Unknown			1987	225	547.5	0.3	1	2.689	7.896	18.096	1.411	0.059	0.110	0.322	0.737	0.058	0.002
RTG	99073	Mi Jack	1000R	Detroit	6-71	1990	238	3500	0.43	1	0.681	3.300	9.016	0.455	0.060	0.269	1.303	3.560	0.180	0.024
Trackmobile	NA	Track Mobile	TM2400			1994	147	520	0.51	1	1.439	3.870	10.478	0.624	0.059	0.062	0.166	0.450	0.027	0.003
RTG	99951	Taylor	9040S	Detroit	Series 50	1999	238	3600	0.43	1	0.270	1.009	6.409	0.155	0.060	0.110	0.410	2.603	0.063	0.024
RTG	99952	Mi Jack	850	Detroit	Series 50	1999	300	2800	0.43	1	0.270	1.009	6.409	0.155	0.052	0.107	0.402	2.552	0.062	0.021
Chassis Stacker	69916	Taylor	TCS 90	Cummins	6 BT	1999	155	300	0.30	1	0.538	2.851	6.862	0.360	0.060	0.008	0.044	0.106	0.006	0.001
Chassis Stacker	69917	Taylor	TCS 90	Cummins	6 BT	1999	155	255	0.30	1	0.538	2.851	6.862	0.360	0.060	0.007	0.037	0.090	0.005	0.001
Chassis Stacker	60302	Taylor	THD 2005	Cummins	6 BT	2003	155	1650	0.30	1	0.248	2.765	5.091	0.210	0.060	0.021	0.234	0.431	0.018	0.005
RTG	90412	Mi Jack	1200 R	Detroit	Series 50	2004	300	1700	0.43	1	0.091	0.946	4.162	0.097	0.052	0.022	0.229	1.006	0.023	0.013
RTG	90510	Mi Jack	1200 R	Detroit	Series 50	2005	300	1500	0.43	1	0.074	0.933	3.836	0.094	0.052	0.016	0.199	0.818	0.020	0.011
Chassis Stacker	30505	Taylor	T300M	Cummins	6 BT	2005	155	3700	0.30	1	0.117	2.722	4.239	0.134	0.060	0.022	0.516	0.804	0.025	0.011
Yard Hostler	10038	Ottawa	Ottawa	Cummins	5.9	2000	175	2777	0.20	1	0.541	2.862	6.885	0.364	0.060	0.058	0.307	0.738	0.039	0.006
Yard Hostler	10040	Ottawa	Ottawa	Cummins	5.9	2000	175	2292	0.20	1	0.541	2.862	6.885	0.364	0.060	0.048	0.253	0.609	0.032	0.005
Yard Hostler	10051	Ottawa	Ottawa	Cummins	5.9	2000	175	1823	0.20	1	0.541	2.862	6.885	0.364	0.060	0.038	0.201	0.484	0.026	0.004
Yard Hostler	10068	Ottawa	Ottawa	Cummins	5.9	2000	175	1856	0.20	1	0.541	2.862	6.885	0.364	0.060	0.039	0.205	0.493	0.026	0.004
Yard Hostler	10113	Ottawa	Ottawa	Cummins	5.9	2001	175	2047	0.20	1	0.532	2.835	6.827	0.355	0.060	0.042	0.224	0.539	0.028	0.005
Yard Hostler	10313	Ottawa	Ottawa	Cummins	5.9	2003	175	2358	0.20	1	0.250	2.781	5.117	0.214	0.060	0.023	0.253	0.466	0.019	0.005
Yard Hostler	10314	Ottawa	Ottawa	Cummins	5.9	2003	175	3564	0.20	1	0.250	2.781	5.117	0.214	0.060	0.034	0.382	0.704	0.029	0.008
Yard Hostler	10315	Ottawa	Ottawa	Cummins	5.9	2003	175	4038	0.20	1	0.250	2.781	5.117	0.214	0.060	0.039	0.433	0.797	0.033	0.009
Yard Hostler	10316	Ottawa	Ottawa	Cummins	5.9	2003	175	3828	0.20	1	0.250	2.781	5.117	0.214	0.060	0.037	0.411	0.756	0.032	0.009
Yard Hostler	10317	Ottawa	Ottawa	Cummins	5.9	2003	175	3426	0.20	1	0.250	2.781	5.117	0.214	0.060	0.033	0.368	0.676	0.028	0.008
Yard Hostler	10355	Ottawa	Ottawa	Cummins	5.9	2003	175	1123	0.20	1	0.250	2.781	5.117	0.214	0.060	0.011	0.120	0.222	0.009	0.003
Yard Hostler	10356	Ottawa	Ottawa	Cummins	5.9	2003	175	3505	0.20	1	0.250	2.781	5.117	0.214	0.060	0.034	0.376	0.692	0.029	0.008
Yard Hostler	10357	Ottawa	Ottawa	Cummins	5.9	2003	175	3389	0.20	1	0.250	2.781	5.117	0.214	0.060	0.033	0.364	0.669	0.028	0.008
Yard Hostler	10472	Ottawa	Ottawa	Cummins	5.9	2004	175	2874	0.20	1	0.164	2.754	4.553	0.165	0.060	0.018	0.305	0.505	0.018	0.007
Yard Hostler	10473	Ottawa	Ottawa	Cummins	5.9	2004	175	2510	0.20	1	0.164	2.754	4.553	0.165	0.060	0.016	0.267	0.441	0.016	0.006
Yard Hostler	10569	Ottawa	Ottawa	Cummins	5.9	2005	175	2410	0.20	1	0.117	2.727	4.246	0.135	0.060	0.011	0.254	0.395	0.013	0.006
Yard Hostler	10570	Ottawa	Ottawa	Cummins	5.9	2005	175	2109	0.20	1	0.117	2.727	4.246	0.135	0.060	0.010	0.222	0.345	0.011	0.005
Yard Hostler	10571	Ottawa	Ottawa	Cummins	5.9	2005	175	814	0.20	1	0.117	2.727	4.246	0.135	0.060	0.004	0.086	0.133	0.004	0.002
Yard Hostler	10572	Ottawa	Ottawa	Cummins	5.9	2005	175	1758	0.20	1	0.117	2.727	4.246	0.135	0.060	0.008	0.185	0.288	0.009	0.004
Yard Hostler	10573	Ottawa	Ottawa	Cummins	5.9	2005	175	1434	0.20	1	0.117	2.727	4.246	0.135	0.060	0.006	0.151	0.235	0.007	0.003
Yard Hostler	10574	Ottawa	Ottawa	Cummins	5.9	2005	175	2063	0.20	1	0.117	2.727	4.246	0.135	0.060	0.009	0.217	0.338	0.011	0.005
<b>Total</b>										<b>36</b>					<b>1,336</b>	<b>9,535</b>	<b>23,905</b>	<b>0,951</b>	<b>0,236</b>	

CHE Total

HE Total

## Notes

1. Hours of operation provided by UPRR personnel.
  2. Emission factors from CARB's Cargo Handling Equipment Emission Calculation Spreadsheet.
  3. The load factor for yard hostlers was adjusted from the CARB Spreadsheet Model default of 0.65 to 0.20, based on new data that was collected by both UPRR and BNSF.

1.138 8.984 22.559 0.854 0.231

0.199      0.551      1.346      0.097      0.006

Summary of Emissions from Diesel-Fueled Cargo Handling Equipment  
Oakland Rail Yard, Oakland, California

Equipment Type	Equipment ID/Owner	Make	Model	Engine Make	Engine Model	Year	Rating (hp)	Annual Hours of Operation	CHE Rule Compliance Deadline	Load Factor	No. of Units	2007 Emission Factors (g/bhp-hr) <sup>2</sup>					2007 Emission (tons/yr)					
												HC	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx	
Crane	73316	Drott	2500	Case	504 BDT	1973	250	0	12/31/2007	0.43	1	1.301	6.417	15.457	0.919	0.060	0.000	0.000	0.000	0.000	0.000	
Crane	8900304	Lorain	LRT250D			1975	200	51	12/31/2010	0.43	1	1.648	4.264	11.449	0.739	0.059	0.000	0.000	0.000	0.000	0.000	
RTG	97924	Detroit	800 AC	Detroit	6-71	1979	238	0	12/31/2007	0.43	1	NA	NA	NA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Backhoe	NA	Ford	555 Special			1983	55	0	12/31/2007	0.55	1	3.632	7.812	18.728	1.717	0.061	0.000	0.000	0.000	0.000	0.000	
Forklift	41410611	Hyster	Unknown			1987	225	0	12/31/2007	0.3	1	2.689	7.896	18.096	1.411	0.059	0.000	0.000	0.000	0.000	0.000	
RTG	99073	Mi Jack	1000R	Detroit	6-71	1990	238	2959	12/31/2008	0.43	1	0.681	3.300	9.016	0.455	0.060	0.227	1.102	3.010	0.152	0.020	
Trackmobile	NA	Track Mobile	TM2400			1994	147	440	12/31/2008	0.51	1	1.439	3.870	10.478	0.624	0.059	0.052	0.141	0.381	0.023	0.002	
RTG	99951	Taylor	9040S	Detroit	Series 50	1999	238	3044	12/31/2009	0.43	1	0.270	1.009	6.409	0.155	0.060	0.093	0.347	2.201	0.053	0.021	
RTG	99952	Mi Jack	850	Detroit	Series 50	1999	300	2367	12/31/2009	0.43	1	0.270	1.009	6.409	0.155	0.052	0.091	0.340	2.157	0.052	0.018	
Chassis Stacker	69916	Taylor	TCS 90	Cummins	6 BT	1999	155	254	12/31/2009	0.30	1	0.538	2.851	6.862	0.360	0.060	0.007	0.037	0.089	0.005	0.001	
Chassis Stacker	69917	Taylor	TCS 90	Cummins	6 BT	1999	155	216	12/31/2012	0.30	1	0.538	2.851	6.862	0.360	0.060	0.006	0.032	0.076	0.004	0.001	
Chassis Stacker	60302	Taylor	THD 2005	Cummins	6 BT	2003	155	1395	12/31/2010	0.30	1	0.248	2.765	5.091	0.210	0.060	0.018	0.198	0.364	0.015	0.004	
RTG	90412	Mi Jack	1200 R	Detroit	Series 50	2004	300	1437	12/31/2010	0.43	1	0.091	0.946	4.162	0.097	0.052	0.019	0.193	0.850	0.020	0.011	
RTG	90510	Mi Jack	1200 R	Detroit	Series 50	2005	300	1268	12/31/2010	0.43	1	0.074	0.933	3.836	0.094	0.052	0.013	0.168	0.692	0.017	0.009	
Chassis Stacker	30505	Taylor	T300M	Cummins	6 BT	2005	155	3128	12/31/2012	0.30	1	0.117	2.722	4.239	0.134	0.060	0.019	0.436	0.680	0.022	0.010	
RTG						2006	300	2500	12/31/2013	0.43	1	0.074	0.933	3.836	0.094	0.052	0.026	0.332	1.364	0.033	0.018	
Yard Hostler	10038	Ottawa	Ottawa	Cummins	5.9	2000	175	2348	12/31/2007	0.20	1	0.541	2.862	6.885	0.364	0.060	0.049	0.259	0.624	0.033	0.005	
Yard Hostler	10040	Ottawa	Ottawa	Cummins	5.9	2000	175	1938	12/31/2007	0.20	1	0.541	2.862	6.885	0.365	0.060	0.040	0.214	0.515	0.027	0.004	
Yard Hostler	10051	Ottawa	Ottawa	Cummins	5.9	2000	175	1541	12/31/2007	0.20	1	0.541	2.862	6.885	0.365	0.060	0.032	0.170	0.409	0.022	0.004	
Yard Hostler	10068	Ottawa	Ottawa	Cummins	5.9	2000	175	1569	12/31/2008	0.20	1	0.541	2.862	6.885	0.364	0.060	0.033	0.173	0.417	0.022	0.004	
Yard Hostler	10113	Ottawa	Ottawa	Cummins	5.9	2001	175	1731	12/31/2008	0.20	1	0.532	2.835	6.827	0.355	0.060	0.036	0.189	0.456	0.024	0.004	
Yard Hostler	10313	Ottawa	Ottawa	Cummins	5.9	2003	175	1994	12/31/2010	0.20	1	0.250	2.781	5.117	0.214	0.060	0.019	0.214	0.394	0.016	0.005	
Yard Hostler	10314	Ottawa	Ottawa	Cummins	5.9	2003	175	3013	12/31/2010	0.20	1	0.250	2.781	5.117	0.214	0.060	0.029	0.323	0.595	0.025	0.007	
Yard Hostler	10315	Ottawa	Ottawa	Cummins	5.9	2003	175	3414	12/31/2010	0.20	1	0.250	2.781	5.117	0.214	0.060	0.033	0.366	0.674	0.028	0.008	
Yard Hostler	10316	Ottawa	Ottawa	Cummins	5.9	2003	175	3236	12/31/2011	0.20	1	0.250	2.781	5.117	0.214	0.060	0.031	0.347	0.639	0.027	0.007	
Yard Hostler	10317	Ottawa	Ottawa	Cummins	5.9	2003	175	2896	12/31/2012	0.20	1	0.250	2.781	5.117	0.214	0.060	0.028	0.311	0.572	0.024	0.007	
Yard Hostler	10355	Ottawa	Ottawa	Cummins	5.9	2003	175	950	12/31/2012	0.20	1	0.250	2.781	5.117	0.214	0.060	0.009	0.102	0.188	0.008	0.002	
Yard Hostler	10356	Ottawa	Ottawa	Cummins	5.9	2003	175	2963	12/31/2012	0.20	1	0.250	2.781	5.117	0.214	0.060	0.029	0.318	0.585	0.024	0.007	
Yard Hostler	10357	Ottawa	Ottawa	Cummins	5.9	2003	175	2865	12/31/2012	0.20	1	0.250	2.781	5.117	0.214	0.060	0.028	0.307	0.566	0.024	0.007	
Yard Hostler	10472	Ottawa	Ottawa	Cummins	5.9	2004	175	2430	12/31/2011	0.20	1	0.164	2.754	4.553	0.165	0.060	0.015	0.258	0.427	0.015	0.006	
Yard Hostler	10473	Ottawa	Ottawa	Cummins	5.9	2004	175	2122	12/31/2011	0.20	1	0.164	2.754	4.553	0.165	0.060	0.013	0.225	0.373	0.013	0.005	
Yard Hostler	10569	Ottawa	Ottawa	Cummins	5.9	2005	175	2038	12/31/2012	0.20	1	0.117	2.727	4.246	0.135	0.060	0.009	0.214	0.334	0.011	0.005	
Yard Hostler	10570	Ottawa	Ottawa	Cummins	5.9	2005	175	1783	12/31/2012	0.20	1	0.117	2.727	4.246	0.135	0.060	0.008	0.188	0.292	0.009	0.004	
Yard Hostler	10571	Ottawa	Ottawa	Cummins	5.9	2005	175	689	12/31/2012	0.20	1	0.117	2.727	4.246	0.135	0.060	0.003	0.072	0.113	0.004	0.002	
Yard Hostler	10572	Ottawa	Ottawa	Cummins	5.9	2005	175	1487	12/31/2014	0.20	1	0.117	2.727	4.246	0.135	0.060	0.007	0.156	0.244	0.008	0.003	
Yard Hostler	10573	Ottawa	Ottawa	Cummins	5.9	2005	175	1213	12/31/2014	0.20	1	0.117	2.727	4.246	0.135	0.060	0.005	0.128	0.199	0.006	0.003	
Yard Hostler	10574	Ottawa	Ottawa	Cummins	5.9	2005	175	1744	12/31/2014	0.20	1	0.117	2.727	4.246	0.135	0.060	0.008	0.183	0.286	0.009	0.004	
												37						<b>1.036</b>	<b>8.045</b>	<b>20.762</b>	<b>0.775</b>	<b>0.215</b>

CHE Total

0.983 7.904 20.381 0.752 0.213

HE Total

0.052 0.141 0.381 0.023 0.002

Notes:

- The hours of operation are equal to the 2005 hours of operation x (2007 lift count/2005 lift count).
- Emission factors from CARB's Cargo Handling Equipment Emission Calculation Spreadsheet.
- The Drott crane, Ford backhoe, Hyster forklift, and RTG #97924 were taken out of service to comply with the CHE Regulation.
- Assumed the equipment achieved compliance with the CHE Regulation on the compliance deadline (i.e. the emissions reductions for a unit with a 12/31/07 compliance deadline would begin on 1/1/08).

Summary of Emissions from Diesel-Fueled Cargo Handling Equipment  
Oakland Rail Yard, Oakland, California

Equipment Type	Equipment ID/Owner	Make	Model	Engine Make	Engine Model	Year	Rating (hp)	Annual Hours of Operation	CHE Rule Compliance Deadline	Load Factor	No. of Units	2010 Emission Factors					2010 Emission (tons/yr)				
												(g/bhp-hr) <sup>2</sup>					(tons/yr)				
												HC	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Crane	73316	Drott	2500	Case	504 BDT	1973	250	0	12/31/2007	0.43	1	1.301	6.417	15.457	0.460	0.060	0.000	0.000	0.000	0.000	0.000
Crane	8900304	Lorain	LRT250D			1975	200	53	12/31/2010	0.43	1	1.648	4.264	11.449	0.369	0.059	0.000	0.000	0.000	0.000	0.000
RTG	97924	Detroit	800 AC	Detroit	6-71	1979	238	0	12/31/2007	0.43	1	NA	NA	NA	NA	0.000	0.000	0.000	0.000	0.000	0.000
Backhoe	NA	Ford	555 Special			1983	55	0	12/31/2007	0.55	1	3.632	7.812	18.728	0.858	0.061	0.000	0.000	0.000	0.000	0.000
Forklift	41410611	Hyster	Unknown			1987	225	0	12/31/2007	0.3	1	2.689	7.896	18.096	0.706	0.059	0.000	0.000	0.000	0.000	0.000
RTG	99073	Mi Jack	1000R	Detroit	6-71	1990	238	3049	12/31/2008	0.43	1	0.681	3.300	9.016	0.227	0.060	0.234	1.135	3.101	0.078	0.021
Trackmobile	NA	Track Mobile	TM2400			1994	147	453	12/31/2008	0.51	1	1.439	3.870	10.478	0.312	0.059	0.054	0.145	0.392	0.012	0.002
RTG	99951	Taylor	9040S	Detroit	Series 50	1999	238	3136	12/31/2009	0.43	1	0.270	1.009	6.409	0.078	0.060	0.095	0.357	2.267	0.027	0.021
RTG	99952	Mi Jack	850	Detroit	Series 50	1999	300	2439	12/31/2009	0.43	1	0.270	1.009	6.409	0.078	0.052	0.094	0.350	2.223	0.027	0.018
Chassis Stacker	69916	Taylor	TCS 90	Cummins	6 BT	1999	155	262	12/31/2009	0.30	1	0.538	2.851	6.862	0.180	0.060	0.007	0.038	0.092	0.002	0.001
Chassis Stacker	69917	Taylor	TCS 90	Cummins	6 BT	1999	155	223	12/31/2012	0.30	1	0.538	2.851	6.862	0.360	0.060	0.006	0.033	0.078	0.004	0.001
Chassis Stacker	60302	Taylor	THD 2005	Cummins	6 BT	2003	155	1437	12/31/2010	0.30	1	0.248	2.765	5.091	0.210	0.060	0.018	0.204	0.375	0.015	0.004
RTG	90412	Mi Jack	1200 R	Detroit	Series 50	2004	300	1481	12/31/2010	0.43	1	0.091	0.946	4.162	0.097	0.052	0.019	0.199	0.876	0.020	0.011
RTG	90510	Mi Jack	1200 R	Detroit	Series 50	2005	300	1307	12/31/2010	0.43	1	0.074	0.933	3.836	0.094	0.052	0.014	0.173	0.713	0.017	0.010
Chassis Stacker	30505	Taylor	T300M	Cummins	6 BT	2005	155	3223	12/31/2012	0.30	1	0.117	2.722	4.239	0.134	0.060	0.019	0.450	0.700	0.022	0.010
RTG						2006	300	2576	12/31/2013	0.43	1	0.074	0.933	3.836	0.094	0.052	0.027	0.342	1.405	0.034	0.019
RTG						2007	300	2602	At Purchase	0.43	1	0.074	0.933	3.836	0.014	0.052	0.027	0.345	1.419	0.005	0.019
Yard Hostler	10038	Ottawa	Ottawa	Cummins	5.9	2000	175	2419	12/31/2007	0.20	1	0.541	2.862	6.885	0.010	0.060	0.050	0.267	0.643	0.001	0.006
Yard Hostler	10040	Ottawa	Ottawa	Cummins	5.9	2000	175	1997	12/31/2007	0.20	1	0.541	2.862	6.885	0.010	0.060	0.042	0.221	0.530	0.001	0.005
Yard Hostler	10051	Ottawa	Ottawa	Cummins	5.9	2000	175	1588	12/31/2007	0.20	1	0.541	2.862	6.885	0.010	0.060	0.033	0.175	0.422	0.001	0.004
Yard Hostler	10068	Ottawa	Ottawa	Cummins	5.9	2000	175	1617	12/31/2008	0.20	1	0.541	2.862	6.885	0.010	0.060	0.034	0.179	0.430	0.001	0.004
Yard Hostler	10113	Ottawa	Ottawa	Cummins	5.9	2001	175	1783	12/31/2008	0.20	1	0.532	2.835	6.827	0.010	0.060	0.037	0.195	0.470	0.001	0.004
Yard Hostler	10313	Ottawa	Ottawa	Cummins	5.9	2003	175	2054	12/31/2010	0.20	1	0.250	2.781	5.117	0.214	0.060	0.020	0.220	0.406	0.017	0.005
Yard Hostler	10314	Ottawa	Ottawa	Cummins	5.9	2003	175	3104	12/31/2010	0.20	1	0.250	2.781	5.117	0.214	0.060	0.030	0.333	0.613	0.026	0.007
Yard Hostler	10315	Ottawa	Ottawa	Cummins	5.9	2003	175	3517	12/31/2010	0.20	1	0.250	2.781	5.117	0.214	0.060	0.034	0.377	0.694	0.029	0.008
Yard Hostler	10316	Ottawa	Ottawa	Cummins	5.9	2003	175	3334	12/31/2011	0.20	1	0.250	2.781	5.117	0.214	0.060	0.032	0.358	0.658	0.027	0.008
Yard Hostler	10317	Ottawa	Ottawa	Cummins	5.9	2003	175	2984	12/31/2012	0.20	1	0.250	2.781	5.117	0.214	0.060	0.029	0.320	0.589	0.025	0.007
Yard Hostler	10355	Ottawa	Ottawa	Cummins	5.9	2003	175	979	12/31/2012	0.20	1	0.250	2.781	5.117	0.214	0.060	0.009	0.105	0.193	0.008	0.002
Yard Hostler	10356	Ottawa	Ottawa	Cummins	5.9	2003	175	3053	12/31/2012	0.20	1	0.250	2.781	5.117	0.214	0.060	0.029	0.328	0.603	0.025	0.007
Yard Hostler	10357	Ottawa	Ottawa	Cummins	5.9	2003	175	2952	12/31/2012	0.20	1	0.250	2.781	5.117	0.214	0.060	0.028	0.317	0.583	0.024	0.007
Yard Hostler	10472	Ottawa	Ottawa	Cummins	5.9	2004	175	2503	12/31/2011	0.20	1	0.164	2.754	4.553	0.165	0.060	0.016	0.266	0.440	0.016	0.006
Yard Hostler	10473	Ottawa	Ottawa	Cummins	5.9	2004	175	2186	12/31/2011	0.20	1	0.164	2.754	4.553	0.165	0.060	0.014	0.232	0.384	0.014	0.005
Yard Hostler	10569	Ottawa	Ottawa	Cummins	5.9	2005	175	2099	12/31/2012	0.20	1	0.117	2.727	4.246	0.135	0.060	0.009	0.221	0.344	0.011	0.005
Yard Hostler	10570	Ottawa	Ottawa	Cummins	5.9	2005	175	1837	12/31/2012	0.20	1	0.117	2.727	4.246	0.135	0.060	0.008	0.193	0.301	0.010	0.004
Yard Hostler	10571	Ottawa	Ottawa	Cummins	5.9	2005	175	709	12/31/2012	0.20	1	0.117	2.727	4.246	0.135	0.060	0.003	0.075	0.116	0.004	0.002
Yard Hostler	10572	Ottawa	Ottawa	Cummins	5.9	2005	175	1532	12/31/2014	0.20	1	0.117	2.727	4.246	0.135	0.060	0.007	0.161	0.251	0.008	0.004
Yard Hostler	10573	Ottawa	Ottawa	Cummins	5.9	2005	175	1249	12/31/2014	0.20	1	0.117	2.727	4.246	0.135	0.060	0.006	0.131	0.205	0.007	0.003
Yard Hostler	10574	Ottawa	Ottawa	Cummins	5.9	2005	175	1797	12/31/2014	0.20	1	0.117	2.727	4.246	0.135	0.060	0.008	0.189	0.294	0.009	0.004
												38					1.094	8.634	22.811	0.529	0.241

CHE Total

1.040 8.489 22.419 0.517 0.239

HE Total

0.054 0.145 0.392 0.012 0.002

Notes:

1. The hours of operation are equal to the 2005 hours of operation x (2010 predicted lift count/2005 lift count).
2. Emission factors from CARB's Cargo Handling Equipment Emission Calculation Spreadsheet.
3. The Drott crane, Ford backhoe, Hyster forklift, and RTG #97924 were taken out of service to comply with the CHE Regulation.
4. Assumed the equipment achieved compliance with the CHE Regulation on the compliance deadline (i.e. the emissions reductions for a unit with a 12/31/07 compliance deadline would begin on 1/1/08).

Summary of Emissions from Diesel-Fueled Cargo Handling Equipment  
Oakland Rail Yard, Oakland, California

Equipment Type	Equipment ID/Owner	Make	Model	Engine Make	Engine Model	Year	Rating (hp)	Annual Hours of Operation	CHE Rule Compliance Deadline	Load Factor	No. of Units	2015 Emission Factors					2015 Emission (tons/yr)				
												(g/bhp-hr) <sup>2</sup>					(tons/yr)				
												HC	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Crane	73316	Drott	2500	Case	504 BDT	1973	250	0	12/31/2007	0.43	1	1.301	6.417	15.457	0.460	0.060	0.000	0.000	0.000	0.000	0.000
Crane	8900304	Lorain	LRT250D			1975	200	55	12/31/2010	0.43	1	1.648	4.264	11.449	0.369	0.059	0.000	0.000	0.000	0.000	0.000
RTG	97924	Detroit	800 AC	Detroit	6-71	1979	238	0	12/31/2007	0.43	1	NA	NA	NA	NA	0.000	0.000	0.000	0.000	0.000	0.000
Backhoe	NA	Ford	555 Special			1983	55	0	12/31/2007	0.55	1	3.632	7.812	18.728	0.858	0.061	0.000	0.000	0.000	0.000	0.000
Forklift	41410611	Hyster	Unknown			1987	225	0	12/31/2007	0.3	1	2.689	7.896	18.096	0.706	0.059	0.000	0.000	0.000	0.000	0.000
RTG	99073	Mi Jack	1000R	Detroit	6-71	1990	238	3204	12/31/2008	0.43	1	0.681	3.300	9.016	0.227	0.060	0.246	1.193	3.259	0.082	0.022
Trackmobile	NA	Track Mobile	TM2400			1994	147	476	12/31/2008	0.51	1	1.439	3.870	10.478	0.312	0.059	0.057	0.152	0.412	0.012	0.002
RTG	99951	Taylor	9040S	Detroit	Series 50	1999	238	3296	12/31/2009	0.43	1	0.270	1.009	6.409	0.078	0.060	0.100	0.375	2.383	0.029	0.022
RTG	99952	Mi Jack	850	Detroit	Series 50	1999	300	2563	12/31/2009	0.43	1	0.270	1.009	6.409	0.078	0.052	0.098	0.368	2.336	0.028	0.019
Chassis Stacker	69916	Taylor	TCS 90	Cummins	6 BT	1999	155	275	12/31/2009	0.30	1	0.538	2.851	6.862	0.180	0.060	0.008	0.040	0.097	0.003	0.001
Chassis Stacker	69917	Taylor	TCS 90	Cummins	6 BT	1999	155	234	12/31/2012	0.30	1	0.538	2.851	6.862	0.180	0.060	0.006	0.034	0.082	0.002	0.001
Chassis Stacker	60302	Taylor	THD 2005	Cummins	6 BT	2003	155	1511	12/31/2010	0.30	1	0.248	2.765	5.091	0.105	0.060	0.019	0.214	0.394	0.008	0.005
RTG	90412	Mi Jack	1200 R	Detroit	Series 50	2004	300	1557	12/31/2010	0.43	1	0.091	0.946	4.162	0.049	0.052	0.020	0.209	0.921	0.011	0.012
RTG	90510	Mi Jack	1200 R	Detroit	Series 50	2005	300	1373	12/31/2010	0.43	1	0.074	0.933	3.836	0.047	0.052	0.014	0.182	0.749	0.009	0.010
Chassis Stacker	30505	Taylor	T300M	Cummins	6 BT	2005	155	3387	12/31/2012	0.30	1	0.117	2.722	4.239	0.067	0.060	0.020	0.472	0.736	0.012	0.010
RTG						2006	300	2708	12/31/2013	0.43	1	0.074	0.933	3.836	0.047	0.052	0.028	0.359	1.477	0.018	0.020
RTG						2007	300	2708	At Purchase	0.43	1	0.074	0.933	3.836	0.014	0.052	0.028	0.359	1.477	0.005	0.020
Yard Hostler	10038	Ottawa	Ottawa	Cummins	5.9	2000	175	2542	12/31/2007	0.20	1	0.541	2.862	6.885	0.010	0.060	0.053	0.281	0.675	0.001	0.006
Yard Hostler	10040	Ottawa	Ottawa	Cummins	5.9	2000	175	2098	12/31/2007	0.20	1	0.541	2.862	6.885	0.010	0.060	0.044	0.232	0.557	0.001	0.005
Yard Hostler	10051	Ottawa	Ottawa	Cummins	5.9	2000	175	1669	12/31/2007	0.20	1	0.541	2.862	6.885	0.010	0.060	0.035	0.184	0.443	0.001	0.004
Yard Hostler	10068	Ottawa	Ottawa	Cummins	5.9	2000	175	1699	12/31/2008	0.20	1	0.541	2.862	6.885	0.010	0.060	0.035	0.188	0.451	0.001	0.004
Yard Hostler	10113	Ottawa	Ottawa	Cummins	5.9	2001	175	1874	12/31/2008	0.20	1	0.532	2.835	6.827	0.010	0.060	0.038	0.205	0.494	0.001	0.004
Yard Hostler	10313	Ottawa	Ottawa	Cummins	5.9	2003	175	2159	12/31/2010	0.20	1	0.250	2.781	5.117	0.010	0.060	0.021	0.232	0.426	0.001	0.005
Yard Hostler	10314	Ottawa	Ottawa	Cummins	5.9	2003	175	3263	12/31/2010	0.20	1	0.250	2.781	5.117	0.010	0.060	0.031	0.350	0.644	0.001	0.008
Yard Hostler	10315	Ottawa	Ottawa	Cummins	5.9	2003	175	3697	12/31/2010	0.20	1	0.250	2.781	5.117	0.010	0.060	0.036	0.397	0.730	0.001	0.009
Yard Hostler	10316	Ottawa	Ottawa	Cummins	5.9	2003	175	3504	12/31/2011	0.20	1	0.250	2.781	5.117	0.010	0.060	0.034	0.376	0.692	0.001	0.008
Yard Hostler	10317	Ottawa	Ottawa	Cummins	5.9	2003	175	3136	12/31/2012	0.20	1	0.250	2.781	5.117	0.010	0.060	0.030	0.336	0.619	0.001	0.007
Yard Hostler	10355	Ottawa	Ottawa	Cummins	5.9	2003	175	1028	12/31/2012	0.20	1	0.250	2.781	5.117	0.010	0.060	0.010	0.110	0.203	0.000	0.002
Yard Hostler	10356	Ottawa	Ottawa	Cummins	5.9	2003	175	3209	12/31/2012	0.20	1	0.250	2.781	5.117	0.010	0.060	0.031	0.344	0.634	0.001	0.007
Yard Hostler	10357	Ottawa	Ottawa	Cummins	5.9	2003	175	3103	12/31/2012	0.20	1	0.250	2.781	5.117	0.010	0.060	0.030	0.333	0.613	0.001	0.007
Yard Hostler	10472	Ottawa	Ottawa	Cummins	5.9	2004	175	2631	12/31/2011	0.20	1	0.164	2.754	4.553	0.010	0.060	0.017	0.280	0.462	0.001	0.006
Yard Hostler	10473	Ottawa	Ottawa	Cummins	5.9	2004	175	2298	12/31/2011	0.20	1	0.164	2.754	4.553	0.010	0.060	0.015	0.244	0.404	0.001	0.005
Yard Hostler	10569	Ottawa	Ottawa	Cummins	5.9	2005	175	2206	12/31/2012	0.20	1	0.117	2.727	4.246	0.010	0.060	0.010	0.232	0.361	0.001	0.005
Yard Hostler	10570	Ottawa	Ottawa	Cummins	5.9	2005	175	1931	12/31/2012	0.20	1	0.117	2.727	4.246	0.010	0.060	0.009	0.203	0.316	0.001	0.004
Yard Hostler	10571	Ottawa	Ottawa	Cummins	5.9	2005	175	746	12/31/2012	0.20	1	0.117	2.727	4.246	0.010	0.060	0.003	0.078	0.122	0.000	0.002
Yard Hostler	10572	Ottawa	Ottawa	Cummins	5.9	2005	175	1610	12/31/2014	0.20	1	0.117	2.727	4.246	0.010	0.060	0.007	0.169	0.264	0.001	0.004
Yard Hostler	10573	Ottawa	Ottawa	Cummins	5.9	2005	175	1313	12/31/2014	0.20	1	0.117	2.727	4.246	0.010	0.060	0.006	0.138	0.215	0.001	0.003
Yard Hostler	10574	Ottawa	Ottawa	Cummins	5.9	2005	175	1889	12/31/2014	0.20	1	0.117	2.727	4.246	0.010	0.060	0.009	0.199	0.309	0.001	0.004
												38					1.150	9.070	23.959	0.238	0.253

CHE Total 1.093 8.918 23.547 0.226 0.251  
HE Total 0.057 0.152 0.412 0.012 0.002

Notes:

1. The hours of operation are equal to the 2005 hours of operation x (2015 predicted lift count/2005 lift count).
2. Emission factors from CARB's Cargo Handling Equipment Emission Calculation Spreadsheet.
3. The Drott crane, Ford backhoe, Hyster forklift, and RTG #97924 were taken out of service to comply with the CHE Regulation.
4. Assumed the equipment achieved compliance with the CHE Regulation on the compliance deadline (i.e. the emissions reductions for a unit with a 12/31/07 compliance deadline would begin on 1/1/08).

Summary of Emissions from Diesel-Fueled Cargo Handling Equipment  
Oakland Rail Yard, Oakland, California

Equipment Type	Equipment ID/Owner	Make	Model	Engine Make	Engine Model	Year	Rating (hp)	Annual Hours of Operation	CHE Rule Compliance Deadline	Load Factor	No. of Units	2020 Emission Factors (g/bhp-hr) <sup>2</sup>					2020 Emission (tons/yr)				
																	(tons/yr)				
												HC	CO	NOx	DPM	SOx	ROG	CO	NOx	DPM	SOx
Crane	73316	Drott	2500	Case	504 BDT	1973	250	0	12/31/2007	0.43	1	1.301	6.417	15.457	0.460	0.060	0.000	0.000	0.000	0.000	
Crane	8900304	Lorain	LRT250D			1975	200	58	12/31/2010	0.43	1	1.648	4.264	11.449	0.369	0.059	0.000	0.000	0.000	0.000	
RTG	97924	Detroit	800 AC	Detroit	6-71	1979	238	0	12/31/2007	0.43	1	NA	NA	NA	NA	0.000	0.000	0.000	0.000	0.000	
Backhoe	NA	Ford	555 Special			1983	55	0	12/31/2007	0.55	1	3.632	7.812	18.728	0.858	0.061	0.000	0.000	0.000	0.000	
Forklift	41410611	Hyster	Unknown			1987	225	0	12/31/2007	0.3	1	2.689	7.896	18.096	0.706	0.059	0.000	0.000	0.000	0.000	
RTG	99073	Mi Jack	1000R	Detroit	6-71	1990	238	3368	12/31/2008	0.43	1	0.681	3.300	9.016	0.227	0.060	0.259	1.254	3.426	0.086	0.023
Trackmobile	NA	Track Mobile	TM2400			1994	147	501	12/31/2008	0.51	1	1.439	3.870	10.478	0.312	0.059	0.060	0.160	0.434	0.013	0.002
RTG	99951	Taylor	9040S	Detroit	Series 50	1999	238	3464	12/31/2009	0.43	1	0.270	1.009	6.409	0.078	0.060	0.105	0.394	2.504	0.030	0.023
RTG	99952	Mi Jack	850	Detroit	Series 50	1999	300	2694	12/31/2009	0.43	1	0.270	1.009	6.409	0.078	0.052	0.103	0.387	2.455	0.030	0.020
Chassis Stacker	69916	Taylor	TCS 90	Cummins	6 BT	1999	155	289	12/31/2009	0.30	1	0.538	2.851	6.862	0.180	0.060	0.008	0.042	0.102	0.003	0.001
Chassis Stacker	69917	Taylor	TCS 90	Cummins	6 BT	1999	155	246	12/31/2012	0.30	1	0.538	2.851	6.862	0.180	0.060	0.007	0.036	0.087	0.002	0.001
Chassis Stacker	60302	Taylor	THD 2005	Cummins	6 BT	2003	155	1588	12/31/2010	0.30	1	0.248	2.765	5.091	0.105	0.060	0.020	0.225	0.414	0.009	0.005
RTG	90412	Mi Jack	1200 R	Detroit	Series 50	2004	300	1636	12/31/2010	0.43	1	0.091	0.946	4.162	0.049	0.052	0.021	0.220	0.968	0.011	0.012
RTG	90510	Mi Jack	1200 R	Detroit	Series 50	2005	300	1444	12/31/2010	0.43	1	0.074	0.933	3.836	0.047	0.052	0.015	0.192	0.788	0.010	0.011
Chassis Stacker	30505	Taylor	T300M	Cummins	6 BT	2005	155	3560	12/31/2012	0.30	1	0.117	2.722	4.239	0.067	0.060	0.021	0.497	0.773	0.012	0.011
RTG						2006	300	2846	12/31/2013	0.43	1	0.074	0.933	3.836	0.047	0.052	0.030	0.377	1.553	0.019	0.021
RTG						2007	300	2846	At Purchase	0.43	1	0.074	0.933	3.836	0.014	0.052	0.030	0.377	1.553	0.006	0.021
Yard Hostler	10038	Ottawa	Ottawa	Cummins	5.9	2000	175	2672	12/31/2007	0.20	1	0.541	2.862	6.885	0.010	0.060	0.056	0.295	0.710	0.001	0.006
Yard Hostler	10040	Ottawa	Ottawa	Cummins	5.9	2000	175	2205	12/31/2007	0.20	1	0.541	2.862	6.885	0.010	0.060	0.046	0.243	0.586	0.001	0.005
Yard Hostler	10051	Ottawa	Ottawa	Cummins	5.9	2000	175	1754	12/31/2007	0.20	1	0.541	2.862	6.885	0.010	0.060	0.037	0.194	0.466	0.001	0.004
Yard Hostler	10068	Ottawa	Ottawa	Cummins	5.9	2000	175	1786	12/31/2008	0.20	1	0.541	2.862	6.885	0.010	0.060	0.037	0.197	0.474	0.001	0.004
Yard Hostler	10113	Ottawa	Ottawa	Cummins	5.9	2001	175	1970	12/31/2008	0.20	1	0.532	2.835	6.827	0.010	0.060	0.040	0.215	0.519	0.001	0.005
Yard Hostler	10313	Ottawa	Ottawa	Cummins	5.9	2003	175	2269	12/31/2010	0.20	1	0.250	2.781	5.117	0.010	0.060	0.022	0.243	0.448	0.001	0.005
Yard Hostler	10314	Ottawa	Ottawa	Cummins	5.9	2003	175	3429	12/31/2010	0.20	1	0.250	2.781	5.117	0.010	0.060	0.033	0.368	0.677	0.001	0.008
Yard Hostler	10315	Ottawa	Ottawa	Cummins	5.9	2003	175	3885	12/31/2010	0.20	1	0.250	2.781	5.117	0.010	0.060	0.037	0.417	0.767	0.001	0.009
Yard Hostler	10316	Ottawa	Ottawa	Cummins	5.9	2003	175	3683	12/31/2011	0.20	1	0.250	2.781	5.117	0.010	0.060	0.036	0.395	0.727	0.001	0.008
Yard Hostler	10317	Ottawa	Ottawa	Cummins	5.9	2003	175	3296	12/31/2012	0.20	1	0.250	2.781	5.117	0.010	0.060	0.032	0.354	0.651	0.001	0.008
Yard Hostler	10355	Ottawa	Ottawa	Cummins	5.9	2003	175	1081	12/31/2012	0.20	1	0.250	2.781	5.117	0.010	0.060	0.010	0.116	0.213	0.000	0.002
Yard Hostler	10356	Ottawa	Ottawa	Cummins	5.9	2003	175	3372	12/31/2012	0.20	1	0.250	2.781	5.117	0.010	0.060	0.033	0.362	0.666	0.001	0.008
Yard Hostler	10357	Ottawa	Ottawa	Cummins	5.9	2003	175	3261	12/31/2012	0.20	1	0.250	2.781	5.117	0.010	0.060	0.031	0.350	0.644	0.001	0.008
Yard Hostler	10472	Ottawa	Ottawa	Cummins	5.9	2004	175	2765	12/31/2011	0.20	1	0.164	2.754	4.553	0.010	0.060	0.017	0.294	0.486	0.001	0.006
Yard Hostler	10473	Ottawa	Ottawa	Cummins	5.9	2004	175	2415	12/31/2011	0.20	1	0.164	2.754	4.553	0.010	0.060	0.015	0.257	0.424	0.001	0.006
Yard Hostler	10569	Ottawa	Ottawa	Cummins	5.9	2005	175	2319	12/31/2012	0.20	1	0.117	2.727	4.246	0.010	0.060	0.010	0.244	0.380	0.001	0.005
Yard Hostler	10570	Ottawa	Ottawa	Cummins	5.9	2005	175	2029	12/31/2012	0.20	1	0.117	2.727	4.246	0.010	0.060	0.009	0.213	0.332	0.001	0.005
Yard Hostler	10571	Ottawa	Ottawa	Cummins	5.9	2005	175	784	12/31/2012	0.20	1	0.117	2.727	4.246	0.010	0.060	0.004	0.082	0.128	0.000	0.002
Yard Hostler	10572	Ottawa	Ottawa	Cummins	5.9	2005	175	1692	12/31/2014	0.20	1	0.117	2.727	4.246	0.010	0.060	0.008	0.178	0.277	0.001	0.004
Yard Hostler	10573	Ottawa	Ottawa	Cummins	5.9	2005	175	1380	12/31/2014	0.20	1	0.117	2.727	4.246	0.010	0.060	0.006	0.145	0.226	0.001	0.003
Yard Hostler	10574	Ottawa	Ottawa	Cummins	5.9	2005	175	1985	12/31/2014	0.20	1	0.117	2.727	4.246	0.010	0.060	0.009	0.209	0.325	0.001	0.005
												38					1.209	9.534	25.183	0.250	0.266

CHE Total

1.149 9.373 24.749 0.237 0.264

HE Total

0.060 0.160 0.434 0.013 0.002

Notes:

1. The hours of operation are equal to the 2005 hours of operation x (2020 predicted lift count/2005 lift count).
2. Emission factors from CARB's Cargo Handling Equipment Emission Calculation Spreadsheet.
3. The Drott crane, Ford backhoe, Hyster forklift, and RTG #97924 were taken out of service to comply with the CHE Regulation.
4. Assumed the equipment achieved compliance with the CHE Regulation on the compliance deadline (i.e. the emissions reductions for a unit with a 12/31/07 compliance deadline would begin on 1/1/08).

Summary of Emissions from Diesel-Fueled Heavy Equipment  
 Oakland Rail Yard, Oakland, California

Equipment Type	Location	Equipment ID/Owner	Make	Model	Year	Rating (hp)	Annual Hours of Operation <sup>3</sup>	No of Units	Load Factor	2005 Emission Factors					VOC Evaporative Emissions <sup>6</sup>		2005 Emission Estimates						
										(g/bhp-hr) <sup>4</sup>					Part 1 (g/hr)		Part 2 (g/yr)		(tons/yr)				
										HC	CO	NOx	DPM	SOx	-	-	-	ROG	CO	NOx	DPM	SOx	
Yard Hostler <sup>1</sup>	IMS	NA	Capacity	1986	125	25	1	0.2	2.928	8.438	19.249	1.558	0.059	-	-	-	0.002	0.006	0.013	0.001	0.000		
Backhoe	Track Dept	UP	Case	580C	pre-1983	62	75	1	0.55	3.632	7.812	18.728	1.717	0.061	-	-	-	0.010	0.022	0.053	0.005	0.000	
Yard Hostler <sup>2</sup>	Sid's Mobile Repair	Sids	Capacity		1986	125	365	1	0.2	2.928	8.438	19.249	1.558	0.059	-	-	-	0.029	0.085	0.194	0.016	0.001	
Fork Lift	TTX	TTX	Cat		pre-1990	90	730	1	0.3	3.776	7.897	18.180	1.983	0.061	-	-	-	0.082	0.172	0.395	0.043	0.001	
Fork Lift	TTX	TTX	Nissan		2005	114	416	1	0.3	0.368	3.215	5.020	0.254	0.061	-	-	-	0.006	0.050	0.079	0.004	0.001	
Man Lift <sup>3</sup>	Locomotive Shop	Hertz Rental	JLG	460SJ	2001	50	250	1	0.46	2.245	5.045	5.481	0.579	0.068	-	-	-	0.014	0.032	0.035	0.004	0.000	
<b>Total</b>								<b>6</b>									<b>0.14</b>	<b>0.37</b>	<b>0.77</b>	<b>0.072</b>	<b>0.00</b>		

Notes:

1. Per IMS, this unit runs about 125 miles per year and idles 10 hours per year. Total operating hours were calculated assuming that the unit operated 125 miles at an average speed of 10 miles per hours plus the 10 hours per year of idling.
2. Per Sid's Mobile Repair personnel, this unit is used approximately once per day to transport a container to the facility for repair. Based on personal observation, it was assumed that the average use was no more than 1 hour per day.
3. Hours of operation are an engineering estimate based on personal observation.
4. VOC evaporative emissions are negligible.

## TRUs AND REEFER CARS

Summary of Emissions from Transport Refrigeration Units and Refrigerated Railcars  
 Oakland Rail Yard, Oakland, California

TRU Equip Type	Average Rating (hp) <sup>1</sup>	Fuel Type	Average No. Units in Yard <sup>2</sup>	Hours of Operation (hr/day) <sup>3</sup> (hr/yr) <sup>4</sup>	Load Factor <sup>5</sup>	2005 Emission Factors					VOC Evaporative Emission Factors <sup>7</sup>		2005 Emissions Estimates						
						(g/bhp-hr) <sup>6</sup>							(tons/yr)						
						HC	CO	NOx	DPM	SOx			Part 1 (g/hr)	Part 2 (g/yr)	ROG	CO	NOx	DPM	SOx
Container Railcar	28.56	Diesel	70	4	1,460	0.56	2.85	6.78	6.43	0.71	0.07	-	-	5.12	12.16	11.53	1.281	0.12	
	34	Diesel	4	4	1,460	0.53	3.23	7.49	6.71	0.79	0.07	-	-	0.38	0.87	0.78	0.091	0.01	
<b>Total</b>			<b>74</b>		<b>2,920</b>									<b>5.49</b>	<b>13.03</b>	<b>12.31</b>	<b>1.372</b>	<b>0.13</b>	

Notes:

1. Based on the average horsepower distribution in the OFFROAD2007 model.
2. UPRR staff estimate that there are 6-35 TRUs and 0-2 reefer cars in the Yard at any given time. To be conservative, these estimates were increased by 100%.
3. From CARB's Staff Report: ISOR, ATCM for TRUs, Section V.a.2.
4. It was assumed that the number of units and the annual hours of operations remains constant, with individual units cycling in and out of the yard.
5. Load factors are the default factors from the OFFROAD2007 model.
6. Emission factors from the OFFROAD2007 model.
7. VOC evaporative emissions are negligible.

Summary of Emissions from Transport Refrigeration Units and Refrigerated Railcars  
 Oakland Rail Yard, Oakland, California

TRU Equip Type	Average Rating (hp) <sup>1</sup>	Fuel Type	Average No. Units in Yard <sup>2</sup>	Hours of Operation (hr/day) <sup>3</sup> (hr/yr) <sup>4</sup>	Load Factor <sup>5</sup>	2007 Emission Factors					VOC Evaporative Emission Factors <sup>7</sup>		2007 Emissions Estimates									
						(g/bhp-hr) <sup>6</sup>							Part 1 (g/hr)		Part 2 (g/yr)		(tons/yr)					
						HC	CO	NOx	DPM	SOx			-	-	ROG	CO	NOx	DPM	SOx			
Container Railcar	28.56	Diesel	60	4	1,460	0.56	2.85	6.78	6.43	0.71	0.07	-	-	4.39	10.42	9.88	1.098	0.11				
	34	Diesel	4	4	1,460	0.53	3.23	7.49	6.71	0.79	0.07	-	-	0.38	0.87	0.78	0.091	0.01				
<b>Total</b>			<b>64</b>		<b>2,920</b>									<b>4.76</b>	<b>11.29</b>	<b>10.66</b>	<b>1.189</b>	<b>0.11</b>				

Notes:

1. Based on the average horsepower distribution in the OFFROAD2007 model.
2. Number of TRUs in yard is equal to 2005 TRUs x (2007 lift count/2005 lift count).
3. From CARB's Staff Report: ISOR, ATCM for TRUs, Section V.a.2.
4. It was assumed that the number of units and the annual hours of operations remains constant, with individual units cycling in and out of the yard.
5. Load factors are the default factors from the OFFROAD2007 model.
6. Emission factors from the OFFROAD2007 model.
7. VOC evaporative emissions are negligible.

Summary of Emissions from Transport Refrigeration Units and Refrigerated Railcars  
 Oakland Rail Yard, Oakland, California

TRU Equip Type	Average Rating (hp) <sup>1</sup>	Fuel Type	Average No. Units in Yard <sup>2</sup>	Hours of Operation (hr/day) <sup>3</sup> (hr/yr) <sup>4</sup>	Load Factor <sup>5</sup>	2010 Emission Factors					VOC Evaporative Emission Factors <sup>7</sup>		2010 Emissions Estimates								
						(g/bhp-hr) <sup>6</sup>							Part 1 (g/hr)		Part 2 (g/yr)		(tons/yr)				
						HC	CO	NOx	DPM	SOx			-	-	ROG	CO	NOx	DPM	SOx		
Container Railcar	28.56	Diesel	61	4	1,460	0.56	2.85	6.78	6.43	0.22	0.07	-	-	4.46	10.60	10.05	0.344	0.11			
	34	Diesel	4	4	1,460	0.53	3.23	7.49	6.71	0.22	0.07	-	-	0.38	0.87	0.78	0.026	0.01			
<b>Total</b>			<b>65</b>		<b>2,920</b>									<b>4.83</b>	<b>11.46</b>	<b>10.82</b>	<b>0.369</b>	<b>0.12</b>			

Notes:

1. Based on the average horsepower distribution in the OFFROAD2007 model.
2. Number of TRUs in yard is equal to 2005 TRUs x (2010 lift count/2005 lift count).
3. From CARB's Staff Report: ISOR, ATCM for TRUs, Section V.a.2.
4. It was assumed that the number of units and the annual hours of operations remains constant, with individual units cycling in and out of the yard.
5. Load factors are the default factors from the OFFROAD2007 model.
6. DPM emission factor from TRU ATCM, Table 3.
7. VOC evaporative emissions are negligible.

Summary of Emissions from Transport Refrigeration Units and Refrigerated Railcars  
 Oakland Rail Yard, Oakland, California

TRU Equip Type	Average Rating (hp) <sup>1</sup>	Fuel Type	Average No. Units in Yard <sup>2</sup>	Hours of Operation		Load Factor <sup>5</sup>	2015 Emission Factors					VOC Evaporative Emission Factors <sup>7</sup>		2015 Emissions Estimates				
							(g/bhp-hr) <sup>6</sup>							(tons/yr)				
				HC	CO		NOx	DPM	SOx	Part 1 (g/hr)	Part 2 (g/yr)	ROG	CO	NOx	DPM	SOx		
Container Railcar	28.56	Diesel	65	4	1,460	0.56	2.85	6.78	6.43	0.02	0.07	-	-	4.75	11.29	10.70	0.033	0.11
	34	Diesel	4	4	1,460	0.53	3.23	7.49	6.71	0.02	0.07	-	-	0.38	0.87	0.78	0.002	0.01
<b>Total</b>			<b>69</b>		<b>2,920</b>							<b>5.13</b>	<b>12.16</b>	<b>11.48</b>	<b>0.036</b>	<b>0.12</b>		

Notes:

1. Based on the average horsepower distribution in the OFFROAD2007 model.
2. Number of TRUs in yard is equal to 2005 TRUs x (2015 lift count/2005 lift count).
3. From CARB's Staff Report: ISOR, ATCM for TRUs, Section V.a.2.
4. It was assumed that the number of units and the annual hours of operations remains constant, with individual units cycling in and out of the yard.
5. Load factors are the default factors from the OFFROAD2007 model.
6. DPM emission factor from TRU ATCM, Table 3 - ULETRU factor was used.
7. VOC evaporative emissions are negligible.

Summary of Emissions from Transport Refrigeration Units and Refrigerated Railcars  
 Oakland Rail Yard, Oakland, California

TRU Equip Type	Average Rating (hp) <sup>1</sup>	Fuel Type	Average No. Units in Yard <sup>2</sup>	Hours of Operation		Load Factor <sup>5</sup>	2020 Emission Factors					VOC Evaporative Emission Factors <sup>7</sup>		2020 Emissions Estimates				
							(g/bhp-hr) <sup>6</sup>							(tons/yr)				
				HC	CO		NOx	DPM	SOx	Part 1 (g/hr)	Part 2 (g/yr)	ROG	CO	NOx	DPM	SOx		
Container Railcar	28.56	Diesel	68	4	1,460	0.56	2.85	6.78	6.43	0.02	0.07	-	-	4.97	11.81	11.20	0.035	0.12
	34	Diesel	4	4	1,460	0.53	3.23	7.49	6.71	0.02	0.07	-	-	0.38	0.87	0.78	0.002	0.01
<b>Total</b>			<b>72</b>		<b>2,920</b>							<b>5.35</b>	<b>12.68</b>	<b>11.98</b>	<b>0.037</b>	<b>0.13</b>		

Notes:

1. Based on the average horsepower distribution in the OFFROAD2007 model.
2. Number of TRUs in yard is equal to 2005 TRUs x (2020 lift count/2005 lift count).
3. From CARB's Staff Report: ISOR, ATCM for TRUs, Section V.a.2.
4. It was assumed that the number of units and the annual hours of operations remains constant, with individual units cycling in and out of the yard.
5. Load factors are the default factors from the OFFROAD2007 model.
6. DPM emission factor from TRU ATCM, Table 3 - ULETRU factor was used.
7. VOC evaporative emissions are negligible.

Summary of Emissions from Transport Refrigeration Units and Refrigerated Railcars  
 Oakland Rail Yard, Oakland, California

Center	TRU Equip Type	Average Rating (hp) <sup>1</sup>	Fuel Type	Average No. Units in Yard <sup>2</sup>	Hours of Operation (hr/day) <sup>3</sup> (hr/yr) <sup>4</sup>	Load Factor <sup>5</sup>	Emission Factors					VOC Evaporative Emission Factors <sup>7</sup>		2005 Emissions Estimates						
							(g/bhp-hr) <sup>6</sup>					Part 1 (g/hr)		Part 2 (g/yr)		ROG	CO	NOx	DPM	SOx
							HC	CO	NOx	DPM	SOx									
Pacific Coast Container	Container	28.56	Diesel	38	4	0.56	2.85	6.78	6.43	0.71	0.07	-	-	2.78	6.60	6.26	0.695	0.07		
	Railcar	34	Diesel	18	4	0.53	3.23	7.49	6.71	0.79	0.07	-	-	1.69	3.91	3.50	0.410	0.04		
Pacific Transload System	Container	28.56	Diesel	27	4	0.56	2.85	6.78	6.43	0.71	0.07	-	-	1.97	4.69	4.45	0.494	0.05		
	Railcar	34	Diesel	8	4	0.53	3.23	7.49	6.71	0.79	0.07	-	-	0.75	1.74	1.56	0.182	0.02		
<b>Total</b>				<b>91</b>			<b>5,840</b>							<b>7.19</b>	<b>16.93</b>	<b>15.76</b>	<b>1.782</b>	<b>0.17</b>		

Notes:

1. Based on the average horsepower distribution in the OFFROAD2007 model.
2. From Pacific Coast Container's website. Number of containers is equal to the total number of truck bays minus the number of bays with a reefer plug. Number of rail cars per day was provided by Pacific Coast Containers.
3. From CARB's Staff Report: ISOR, ATCM for TRUs, Section V.a.2.
4. It was assumed that the number of units and the annual hours of operations remains constant, with individual units cycling in and out of the yard.
5. Load factors are the default factors from the OFFROAD2007 model.
6. Emission factors from the OFFROAD2007 model.
7. VOC evaporative emissions are negligible.

Summary of Emissions from Transport Refrigeration Units and Refrigerated Railcars  
 Oakland Rail Yard, Oakland, California

Center	TRU Equip Type	Average Rating (hp) <sup>1</sup>	Fuel Type	Average No. Units in Yard <sup>2</sup>	Hours of Operation (hr/day) <sup>3</sup> (hr/yr) <sup>4</sup>	Load Factor <sup>5</sup>	2007 Emission Factors					VOC Evaporative Emission Factors <sup>7</sup>		2007 Emissions Estimates											
							(g/bhp-hr) <sup>6</sup>							ROG		CO		NOx		DPM		SOx			
							HC	CO	NOx	DPM	SOx			Part 1 (g/hr)	Part 2 (g/yr)										
Pacific Coast Container	Container	28.56	Diesel	32	4	0.56	2.85	6.78	6.43	0.71	0.07			-	-	2.35	5.58	5.29	0.588	0.06					
	Railcar	34	Diesel	15	4	0.53	3.23	7.49	6.71	0.79	0.07			-	-	1.43	3.30	2.96	0.347	0.03					
Pacific Transload System	Container	28.56	Diesel	23	4	0.56	2.85	6.78	6.43	0.71	0.07			-	-	1.67	3.96	3.76	0.418	0.04					
	Railcar	34	Diesel	7	4	0.53	3.23	7.49	6.71	0.79	0.07			-	-	0.63	1.47	1.32	0.154	0.01					
<b>Total</b>				<b>77</b>			<b>5,840</b>									<b>6.08</b>	<b>14.31</b>	<b>13.32</b>	<b>1.506</b>	<b>0.14</b>					

Notes:

1. Based on the average horsepower distribution in the OFFROAD2007 model.
2. The number of units in the yard is equal to the 2005 count x (2007 lift count/2005 lift count).
3. From CARB's Staff Report: ISOR, ATCM for TRUs, Section V.a.2.
4. It was assumed that the number of units and the annual hours of operations remains constant, with individual units cycling in and out of the yard.
5. Load factors are the default factors from the OFFROAD2007 model.
6. Emission factors from the OFFROAD2007 model.
7. VOC evaporative emissions are negligible.

Summary of Emissions from Transport Refrigeration Units and Refrigerated Railcars  
 Oakland Rail Yard, Oakland, California

Center	TRU Equip Type	Average Rating (hp) <sup>1</sup>	Fuel Type	Average No. Units in Yard <sup>2</sup>	Hours of Operation (hr/day) <sup>3</sup> (hr/yr) <sup>4</sup>	Load Factor <sup>5</sup>	2010 Emission Factors					VOC Evaporative Emission Factors <sup>7</sup>		2010 Emissions Estimates											
							(g/bhp-hr) <sup>6</sup>							ROG		CO		NOx		DPM		SOx			
							HC	CO	NOx	DPM	SOx			Part 1 (g/hr)	Part 2 (g/yr)										
Pacific Coast Container	Container	28.56	Diesel	33	4	0.56	2.85	6.78	6.43	0.22	0.07			-	-	2.42	5.75	5.45	0.187	0.06					
	Railcar	34	Diesel	16	4	0.53	3.23	7.49	6.71	0.22	0.07			-	-	1.47	3.40	3.05	0.100	0.03					
Pacific Transload System	Container	28.56	Diesel	24	4	0.56	2.85	6.78	6.43	0.22	0.07			-	-	1.72	4.08	3.87	0.133	0.04					
	Railcar	34	Diesel	7	4	0.53	3.23	7.49	6.71	0.22	0.07			-	-	0.65	1.51	1.36	0.044	0.01					
<b>Total</b>				<b>79</b>			<b>5,840</b>									<b>6.26</b>	<b>14.75</b>	<b>13.73</b>	<b>0.464</b>	<b>0.15</b>					

Notes:

1. Based on the average horsepower distribution in the OFFROAD2007 model.
2. The number of units in the yard is equal to the 2005 count x (2010 predicted lift count/2005 lift count).
3. From CARB's Staff Report: ISOR, ATCM for TRUs, Section V.a.2.
4. It was assumed that the number of units and the annual hours of operations remains constant, with individual units cycling in and out of the yard.
5. Load factors are the default factors from the OFFROAD2007 model.
6. DPM emission factor from TRU ATCM, Table 3.
7. VOC evaporative emissions are negligible.

Summary of Emissions from Transport Refrigeration Units and Refrigerated Railcars  
 Oakland Rail Yard, Oakland, California

Center	TRU Equip Type	Average Rating (hp) <sup>1</sup>	Fuel Type	Average No. Units in Yard <sup>2</sup>	Hours of Operation (hr/day) <sup>3</sup> (hr/yr) <sup>4</sup>	Load Factor <sup>5</sup>	2015 Emission Factors					VOC Evaporative Emission Factors <sup>7</sup>		2015 Emissions Estimates					
							(g/bhp-hr) <sup>6</sup>							(tons/yr)					
							HC	CO	NOx	DPM	SOx			ROG	CO	NOx	DPM	SOx	
Pacific Coast Container	Container	28.56	Diesel	35	4	0.56	2.85	6.78	6.43	0.02	0.07	-	-	2.54	6.04	5.73	0.018	0.06	
	Railcar	34	Diesel	16	4	0.53	3.23	7.49	6.71	0.02	0.07	-	-	1.55	3.58	3.21	0.010	0.03	
Pacific Transload System	Container	28.56	Diesel	25	4	0.56	2.85	6.78	6.43	0.02	0.07	-	-	1.81	4.29	4.07	0.013	0.04	
	Railcar	34	Diesel	7	4	0.53	3.23	7.49	6.71	0.02	0.07	-	-	0.69	1.59	1.42	0.004	0.02	
<b>Total</b>				<b>83</b>			<b>5,840</b>							<b>6.58</b>	<b>15.50</b>	<b>14.43</b>	<b>0.044</b>	<b>0.15</b>	

Notes:

1. Based on the average horsepower distribution in the OFFROAD2007 model.
2. The number of units in the yard is equal to the 2005 count x (2015 predicted lift count/2005 lift count).
3. From CARB's Staff Report: ISOR, ATCM for TRUs, Section V.a.2.
4. It was assumed that the number of units and the annual hours of operations remains constant, with individual units cycling in and out of the yard.
5. Load factors are the default factors from the OFFROAD2007 model.
6. DPM emission factor from TRU ATCM, Table 3 - ULETRU factor was used.
7. VOC evaporative emissions are negligible.

Summary of Emissions from Transport Refrigeration Units and Refrigerated Railcars  
 Oakland Rail Yard, Oakland, California

Center	TRU Equip Type	Average Rating (hp) <sup>1</sup>	Fuel Type	Average No. Units in Yard <sup>2</sup>	Hours of Operation (hr/day) <sup>3</sup> (hr/yr) <sup>4</sup>	Load Factor <sup>5</sup>	2020 Emission Factors					VOC Evaporative Emission Factors <sup>7</sup>		2020 Emissions Estimates											
							(g/bhp-hr) <sup>6</sup>							ROG		CO		NOx		DPM		SOx			
							HC	CO	NOx	DPM	SOx			Part 1 (g/hr)	Part 2 (g/yr)	ROG	CO	NOx	DPM	SOx					
Pacific Coast Container	Container	28.56	Diesel	37	4	0.56	2.85	6.78	6.43	0.02	0.07			-	-	2.67	6.35	6.02	0.019	0.06					
	Railcar	34	Diesel	17	4	0.53	3.23	7.49	6.71	0.02	0.07			-	-	1.62	3.76	3.37	0.010	0.04					
Pacific Transload System	Container	28.56	Diesel	26	4	0.56	2.85	6.78	6.43	0.02	0.07			-	-	1.90	4.51	4.28	0.013	0.05					
	Railcar	34	Diesel	8	4	0.53	3.23	7.49	6.71	0.02	0.07			-	-	0.72	1.67	1.50	0.004	0.02					
<b>Total</b>				<b>88</b>			<b>5,840</b>									<b>6.92</b>	<b>16.29</b>	<b>15.16</b>	<b>0.047</b>	<b>0.16</b>					

Notes:

1. Based on the average horsepower distribution in the OFFROAD2007 model.
2. The number of units in the yard is equal to the 2005 count x (2020 predicted lift count/2005 lift count).
3. From CARB's Staff Report: ISOR, ATCM for TRUs, Section V.a.2.
4. It was assumed that the number of units and the annual hours of operations remains constant, with individual units cycling in and out of the yard.
5. Load factors are the default factors from the OFFROAD2007 model.
6. DPM emission factor from TRU ATCM, Table 3 - ULETRU factor was used.
7. VOC evaporative emissions are negligible.

## **OTHER ON-ROAD TRUCKS**

Summary of Emissions from On-Road Diesel-Fueled Trucks  
Oakland Rail Yard, Oakland, California

**Running Exhaust Emissions**

Equipment Type	Equipment Owner/ID	Vehicle Class	Make	Model	Annual VMT (mi/yr) <sup>1</sup>	Fuel Use (gal/yr) <sup>2</sup>	Carbon Oxidation Factor <sup>3</sup>	2005 Emission Factors						2005 Emission Estimates						
								(g/mi) <sup>4,5</sup>						(kg/gal) <sup>3</sup>				(tons/yr)		
								ROG	CO	NOx	DPM	SOx	CO2	ROG	CO	NOx	DPM	SOx	CO2	
Fuel Truck	Harbor Services	HHD	Ford	8000 series	1984	120	34.93	99%	9.07	30.24	27.22	5.04	0.00	10.15	0.0012	0.0040	0.0036	0.0007	0.0000	0.3510
Auger Truck	MoW	HHD	Ford	K84	1985	100	30.00	99%	9.07	30.51	28.04	4.95	0.00	10.15	0.0010	0.0034	0.0031	0.0005	0.0000	0.3015
Fuel Truck	LERI	HHD	Mack	M5200	1989	520	155.81	99%	9.07	30.91	28.90	4.37	0.34	10.15	0.0052	0.0177	0.0166	0.0025	0.0002	1.5656
Tire Truck	50033	LHDT1	Ford	350 Econoline	1989	400	25.33	99%	0.60	2.42	4.84	0.60	0.00	10.15	0.0003	0.0011	0.0021	0.0003	0.0000	0.2546
Boom Truck	Track Dept	HHD	Ford	F800	1992	200	58.58	99%	6.05	30.24	30.24	3.02	0.38	10.15	0.0013	0.0067	0.0067	0.0007	0.0001	0.5887
Boom Truck	1915-72762	HHD	Volvo	WG64	2001	730	212.67	99%	3.60	8.81	27.88	1.47	0.27	10.15	0.0029	0.0071	0.0224	0.0012	0.0002	2.1370
<b>Total</b>														<b>0.0119</b>	<b>0.0399</b>	<b>0.0545</b>	<b>0.0058</b>	<b>0.0005</b>	<b>5.1983</b>	

**Idling Exhaust Emissions**

Equipment Type	Equip. Owner/ID	Vehicle Class	Make	Model	Idling <sup>6</sup>		Fuel Use (gal/yr) <sup>7</sup>	Carbon Oxidation Factor <sup>3</sup>	2005 Emission Factors						2005 Emissions Estimates						
									(g/hr) <sup>8</sup>						(kg/gal) <sup>3</sup>				(tons/yr)		
					(min/day)	(hr/yr)			ROG	CO	NOx	DPM	SOx	CO2	ROG	CO	NOx	DPM	SOx	CO2	
Fuel Truck	Harbor Services	HHD	Ford	8000 series	1984	15	91	99%	33.61	74.81	58.65	7.10	0.58	10.15	0.0034	0.0075	0.0059	0.0007	0.0001	0.5969	
Auger Truck	MoW	HHD	Ford	K84	1985	15	91	99%	33.61	74.81	58.65	7.10	0.58	10.15	0.0034	0.0075	0.0059	0.0007	0.0001	0.5969	
Fuel Truck	LERI	HHD	Mack	M5200	1989	15	91	99%	19.68	61.68	100.70	3.54	0.58	10.15	0.0020	0.0062	0.0101	0.0004	0.0001	0.5969	
Tire Truck	50033	LHDT1	Ford	350 Econoline	1989	15	91	99%	37.21	3.17	26.30	75.05	2.38	0.37	10.15	0.0003	0.0026	0.0075	0.0002	0.0000	0.3739
Boom Truck	Track Dept	HHD	Ford	F800	1992	15	91	99%	15.71	56.75	100.70	2.65	0.58	10.15	0.0016	0.0057	0.0101	0.0003	0.0001	0.5969	
Boom Truck	1915-72762	HHD	Volvo	WG64	2001	15	91	99%	9.43	46.94	118.24	1.38	0.58	10.15	0.0009	0.0047	0.0119	0.0001	0.0001	0.5969	
<b>Total</b>									<b>0.0116</b>	<b>0.0343</b>	<b>0.0515</b>	<b>0.0024</b>	<b>0.0003</b>	<b>3.3586</b>							

Notes:

1. Annual VMT estimated by UPRR personnel.
2. Fuel use calculated using the EMFAC-WD 2006 model with the BURDEN output option.
3. From *Air Resources Board Draft Emission Factors for Mandatory Reporting Programs*, August 10, 2007.
4. Running exhaust emissions calculated using the EMFAC-WD 2006 model with the BURDEN output option.
5. Running exhaust emission factor calculations assumed an average speed of 15 mph.
6. Idling time (min/day) estimated by UPRR personnel.
7. Idling CO2 exhaust emission factor from EMFAC2006-WD (g/hr) converted to fuel consumption rate (gal/hr) using CO2 factor (10.15 kg/gal) and carbon oxidation factor (99%).
8. Idling exhaust emissions factors calculated using the EMFAC-WD 2006 model with the EMFAC output option.

**APPENDIX B**  
**GROWTH RATE DATA**

**Union Pacific Railroad: Key Operating Measures**  
 Annual Gross Ton-Miles, Revenue Ton-Miles, & Diesel Fuel Consumption

Year	U.P. Revenue Ton Miles per Gallon of Diesel Consumed	% Change	Diesel Fuel Consumed (millions)	% Change	U.P. Revenue Ton Miles (billions)	% Change	U.P. Gross Ton Miles (billions)	% Change
1996	392	-	824	-	323	-	760	-
1997	368	-	1,229	-	452	-	860	13.2%
1998	376	2.2%	1,150	-6.4%	432	-4.4%	826	-3.9%
1999	380	1.2%	1,244	8.2%	473	9.5%	898	8.7%
2000	375	-1.3%	1,293	3.9%	485	2.6%	931	3.7%
2001	391	4.2%	1,287	-0.5%	504	3.8%	958	2.8%
2002	394	0.8%	1,315	2.2%	519	3.0%	994	3.8%
2003	401	1.6%	1,330	1.1%	533	2.7%	1019	2.5%
2004	397	-1.0%	1,377	3.5%	546	2.5%	1038	1.8%
2005	406	2.2%	1,353	-1.7%	549	0.5%	1044	0.6%
2006	412	1.6%	1,372	1.4%	565	3.0%	1073	2.7%
2007	424	2.8%	1,326	-3.4%	562	-0.6%	1052	-1.9%
<b>Average % Change</b>		<b>1.4%</b>		<b>0.8%</b>		<b>2.3%</b>		<b>2.1%</b>

Notes:

Source: Union

Quarterly Earnings Releases and Analyst Presentations (4th Quarter each year 1997-2007)

<http://www.up.com/investors/earnings/index.shtml>

1996 data from UPRR Report R-1 to Surface Transportation Board, provided as reference point to pre-UP/SP merger.

*1996-1997 data not included in averages shown above. UP/SP merger was completed on Sept. 11, 1996; 1998 is first year that is representative for comparison to current operations.*

**Union Pacific Railroad**  
**Lift Count Data for the Oakland Rail Yard**

Calendar Year	Lift Count
2005	349,585
2007	294,328
2008	297,271
2009	300,243
2010	303,246
2011	306,278
2012	309,341
2013	312,435
2014	315,559
2015	318,715
2016	321,902
2017	325,121
2018	328,372
2019	331,656
2020	334,972

Notes:

1. Lift counts for 2005 and 2007 are actual data provided by UPRR.
2. Lift counts for 2008-2020 assume a 1% per year growth rate from 2007.